Arable Farmland
Flora and Invertebrates
Habitat Action Plan

1. Introduction

There has been a severe decline in the number and distribution of many species associated with arable land over the last 65 years, particularly in the latter half of this period, and the need for this action plan relates to this fact rather than the loss of arable land per se, although there has been a geographical retreat of cereal growing in many northern and western areas. Many of the features and biodiversity associated with farmland have their own Action Plans within this BAP, for example ancient and species-rich hedgerows, ponds and farmland birds. For this reason the primary focus of this plan will be the flora and invertebrates found within, and characteristic of, the arable habitat.

Worcestershire is an important county for, in particular, plants associated with arable land: records for several arable flora species suggest that the county has suffered a little less than other parts of the country from the negative effects of intensification following the Second World War and the introduction of the Common Agricultural Policy.

Arable Field Margins are a priority UK BAP Habitat.

2. Current Status

2.1 Description of habitat

The arable field can contain a range of habitat features such as cropped land (autumn and spring sown crops, post-harvest stubble, over-winter stubbles, cultivated fallow), set aside, bare uncropped areas (e.g. failed crops, power line pylons, tramlines), grassy or cultivated field margins, conservation headlands, rough corners (stony, awkward or wet), field tracks, hedges, walls, fences, hedgerow trees, in-field trees, copses, ponds and ditches.

With increased intensification or changes in the timing of cropping, many of these habitats become less hospitable to wildlife or are lost altogether. Different features within the arable landscape support different species and the restoration and management of a wide range of these associated habitats needs to be encouraged.

The main habitats of relevance to this plan include:

Arable field margins

These are strips of land lying between arable crops and the field boundary, and extending for a limited distance into the field, which may be deliberately managed to create conditions that benefit key farmland species.

Arable field margins are valuable in supporting the insect life that underpins much of the farmland food chain. Many invertebrates are found in crops and the grassy banks and other features, such as hedges, at the interface of crops. Flowering plants provide pollen and nectar and the tussocky grasses provide overwintering habitat for many species. These margins and corners therefore support insect-eating chicks of birds such as *Emberiza citrinella* yellowhammer and *Perdix*

perdix grey partridge. Grassy margins are an important food source for *Lepus europaeus* brown hare and also small mammals, which in turn benefits the raptor population. Even more dependent on field margins are the rare arable flora.

Since 2005 farmers have been obliged to establish two metre protection zones against hedgerows and watercourses to comply with GAEC 14 of the Cross Compliance rules (see section 2.4). These margins can be incorporated within set-aside adjacent to the boundary but must be separate from buffer strips established under Environmental Stewardship (ES). Management of the hedgerow or watercourse through ES options can occur within the protection zones. Importantly, a derogation was made available to allow light cultivation of these zones where rare arable plants had been recorded.

Other arable field margins can take the form of:

- Cultivated margins, which can be managed in three ways: a 6-24m *conventional conservation headland*, sown with a cereal crop along with the rest of the field, usually with a full fertiliser programme but with reduced inputs of herbicide, insecticide and fungicide; a *minimal input conservation headland*, sown with a crop but with no fertiliser or manure applied; a 6m *uncropped cultivated margin or plot* that is cultivated with the crop but not sown and has no fertiliser applied and minimal herbicide application with only spot treatment permitted.
- Game crops or pollen and nectar strips.
- Field corners and grass margins – grassy areas managed by cutting every few years (or annually on the inner portion of a wide grassy margin) to prevent scrub encroachment. Tussock forming grasses are generally encouraged unless the strip is sown to a wild flower mixture, in which case finer grasses are preferred as they compete less with the wildflowers.

Recent work by the Centre for Ecology and Hydrology (CEH) and ADAS (Walker *et al*., 2006) on the effectiveness of agri-environment schemes to conserve arable plants found that species richness within conventional conservation headlands was not significantly different from the conventionally managed control margins. This is due to the application of fertiliser still resulting in a competitive crop that shades out the slow growing arable plants. The minimal input conservation headlands (with fertiliser and manure omitted) were significantly more species rich: the more open crop canopy allowing less competitive species to thrive, and the less fertile soils favouring uncommon species over more vigorous, nitrophilous weeds. However, the uncropped cultivated margins have proven to be the most suitable for arable plants, exhibiting the widest diversity of annuals, perennials, grasses, forbs (non-woody, broad-leaved plants other than grass) and spring and autumn germinating species (Walker *et al*., 2006).

Low input crops

As with a conservation headland, a low input cereal crop is managed with reduced inputs of pesticides so as to favour wild arable plants and invertebrates. Ground nesting birds such as *Alauda arvensis* skylark and *Vanellus* vanellus lapwing also benefit from the more open crop canopy, increased food supply and reduced disturbance from farm traffic.

Although 90% of biodiversity on conventionally farmed land is currently found in field boundaries and margins, this is largely due to the lack of in-field habitat

available or the reduced quality of it. There is enormous potential to improve the in-field habitat for wildlife.

Set aside

This was introduced in 1992 as part of a package of reforms of the Common Agricultural Policy. The aim was to prevent the over production that was resulting in 'grain mountains' and applied only to farmers growing crops. Many farmers choose to place their set-aside land in locations where it has the greatest benefit for wildlife. This allows ecosystems to develop that are sheltered from the farming practices taking place alongside. Good examples of beneficial set-aside use include strips alongside woodland, strips and blocks adjoining watercourses and larger blocks between crops.

New areas of set aside support insect and bird life in the same way as do low input crops and cultivated margins – by creating structural diversity and allowing annual plants to flower and seed. It also provides nesting sites for ground nesting birds such as skylarks. As permanent set aside matures it evolves into a low input grassland community. This is still very valuable for insects and birds and in wet locations can quite quickly develop into a very interesting habitat.

In the first year of the scheme farmers had to set aside a minimum of 15% of cropped farmland for the harvest year of 1993. The amount is varied each year and the EC recently confirmed that the set aside requirement for 2008 would be reduced to 0% in response to a fall in world cereal stocks. This is expected to increase output in the UK by at least 10 million tonnes. Environmental organisations are worried about the impact that the zero set aside rate will have on biodiversity, water quality etc. and have asked government to attach some set-aside (i.e. fallowing) to cross-compliance or for it to come with an agri-environment payment as an incentive to retain it where this is warranted. Both possibilities have been discounted for the time being, however, the biodiversity impact will be monitored and DEFRA have not ruled out such measures for the future.

Table 1. Statistics for Set-aside in the UK (UK Agriculture)

Set-aside in the UK	2000	2001	2002	2003	2004	2005
Set Aside (000 hectares)	567	800	612	681	560	559
Set Aside subsidies (£ millions)	127	180	143	177	131	Set aside payment incorporated into SFP

Stubbles

Stubbles can occur at a variety of times throughout the year. After harvest there is a short period before preparation of the ground for the following crop when fallen grain and, particularly in a low input crop, weed seeds and insects can provide an important food source. If a winter crop is not sown this fallow can be left until spring or even for a whole year if the land is put into a summer fallow. Stubbles are at their most valuable when following a low input crop in which beneficial grasses and broad-leaved plants had been encouraged and pesticide input minimised.

2.2 Ecology and habitat requirements of priority species groups

Invertebrates

Arable land is a significant habitat for many invertebrate species. Even excluding soil microorganisms some 2000 species of invertebrate are commonly found in cereal fields, providing a rich food supply for both birds and small mammals: the leaves, flowers and seeds of arable weeds are host to a range of invertebrate food items on which the vast majority of our declining farmland bird species feed their chicks, including grasshoppers, spiders, leaf beetles, weevils, aphids, craneflies, sawfly larvae, butterflies and moths (Winspear and Davies, 2005). Farmland birds are therefore severly affected by the use of pesticides through the direct removal of invertebrates by insecticides and the removal of the food plants of insects by herbicides.

Invertebrates have often been neglected in land management, but they are of critical importance to the health of our countryside. Recent surveys have shown alarming declines in the numbers of insects such as moths and this has undoubtedly had a serious knock-on effect on other wildlife such as birds and bats. For instance, the plummeting population of *Passer domesticus* house sparrow – 58% in the past twenty years – has been attributed to a lack of summer insects. Most Environmental Stewardship options will benefit invertebrates and the goal should be to incorporate as wide a variety of habitat options as possible: field corner management, hedge, ditch and wall options, low and zero input grassland, reduced herbicide cereals, unharvested fertiliser free cereal headlands, beetle banks in bigger fields, pollen and nectar mixes. This wide variety of habitats and resulting plant species, managed in short sections by sensitive mowing regimes will then provide:

- Connective habitats / corridors.
- Continuity of food supplies; the plant species diversity providing pollen, nectar, seeds and prey for a variety of invertebrates.
- Opportunity for re-colonisation of species from adjacent areas.

The shift from spring to autumn cultivation in many arable fields has had an effect on invertebrate groups such as ground beetles, favouring smaller species at the expense of some larger species. Seed eating ground beetles appear to have declined more than other groups of ground beetles and this probably reflects the reduction in weed species in arable fields. The effects of summer insecticides on invertebrates are greater than the effects of autumn applied insecticides (Boatman *et al*, 2004). There is good evidence that insecticides applied during the breeding season also affect breeding performance of *Emberiza calandra* corn bunting and yellowhammer. In the case of the grey partridge, experiments have shown that a reduction in the use of herbicides and insecticides boost insect food available to the chicks, and in turn improves breeding productivity.

Nomada fulvicornis nomad bee is a cleptoparasite of the rare mining bee *Andrena nigrospina*. It has recently been discovered in the conservation headlands at Devils Spittleful nature reserve near Kidderminster foraging on *Raphanus raphanistrum subsp. raphanistrum* wild radish growing in the unsprayed spring barley headland.

Two UK BAP species, *Bombus ruderatus* large garden bumblebee and *Harpalus froelichii* brush-thighed seed-eater, are also associated with cereal field margins.

Arable Flora

Arable flora is the most critically threatened group of plants in Britain and is of conservation concern because of enormous national declines in their distribution and abundance. Overall, some 300 species of plant can occur in arable fields. Threatened and important species found include *Centaurea cyanus* cornflower, *Ranunculus arvensis* corn buttercup, *Scandix pectin-veneris* shepherd's-needle and *Valerianella dentata* narrow-fruited cornsalad. Species such as these, which were once common, are now virtually extinct in Worcestershire.

Many arable species are very particular about where they grow: associating with particular species and exhibiting a long-standing fidelity to certain sites or areas depending on nuanced differences in soil, topography, climate and land use. Many populations of rare species have been recorded from particular fields for decades or even centuries, their fluctuations reflecting the changes in the management of arable landscapes. This combination of site loyalty with the ability of the majority of species to lay dormant yet viable in seed banks for many years means that successful conservation can often be delivered by careful targeted management in the right place.

Recognising that weeds have a conflicting role in agro-ecosystems, by competing with the crop and potentially reducing yields, whilst at the same time providing food for farmland wildlife, weed management today has to reconcile these two conflicting elements. Studies at Rothamsted Research are assessing the relative importance of individual arable weeds to the invertebrate fauna of the arable field and then the relative importance of the weeds/invertebrates to birds so that targeted weed management decisions can be made. Table 2 provides a summary of this research.

Table 2. Relative importance of arable flora to invertebrate fauna, Rothamsted Research.

	Number of insect species recorded[1]	Number of insect families recorded[1]	Relative direct importance to birds[2]	Occurence[3]	Change[4]
Alopecurus myosuroides Black-grass	6	3	n/a	38%	+
Avena fatua Wild-oat	5	4	0	42	•
Chenopodium album Fat-hen	31	15	3	13%	-
Cirsium arvense Creeping Thistle	50	9	1	n/a	n/a
Fallopia convolvulus Black-bindweed	n/a	n/a	3	n/a	n/a
Fumaria officinalis Common Fumitory	3	1	1	17	n/a
Galium aparine Cleavers	30	13	0	58%	+
Matricaria perforata Scentless Mayweed	31	15	n/a	67%	-
Papaver rhoeas Common Poppy	8	7	n/a	18%	•
Poa annua Annual Meadow-grass	53	15	2	79%	•
Polygonum aviculare Knotgrass	61	15	3	n/a	n/a

Senecio vulgaris Grounsel	47	10	2	n/a	n/a
Stellaria media Common Chickweed	71	12	3	94%	•
Viola arvensis Field Pansy	3	3	2	45%	•

1. Assessed using the Centre for Ecology and Hydrology's Phytophagous Insect Data Base. This represents the total number of insect species/families that have been recorded as occurring on that plant.
2. On a scale of 0 to 3 - based on the number of seed-eating bird species that have been recorded as feeding on the seeds of that plant species.
3. Based on percentage of fields infested observed in a recent survey of arable fields in central and southern England.
4. The symbol indicates if the species has been increasing (+), decreasing (-) or remained roughly stable (•) over recent years.

2.3 Distribution and extent

Distribution and trends in invertebrates

Although there is conclusive evidence that many groups of invertebrates – including bumblebees and butterflies – are in rapid decline, there is no overall picture of the well-being of the UK's invertebrates. However, it has been estimated that 80% of Britain's butterflies need arable weeds to survive. Table 3 shows the numbers of nationally scarce species that are particularly associated with arable field margins. Many of these species feed on arable weeds.

Table 3. Numbers of Nationally Scarce invertebrate species associated with arable field margins.

Group	Number of Species
Spiders and allies	6
True bugs – heteroptera	3
True bugs – leafhoppers, planthoppers, froghoppers, treehoppers and cicadas	2
Ground beetles	7
Leaf beetles	12
Weevils	14
Rove beetles	11
Ants, bees and wasps	7

Within Worcestershire there are many locally useful insect records from which empirical conclusions could be drawn about the approximate distributions of certain groups and species. A standardised monitoring programme is needed so that invertebrate population trends can be scientifically evaluated.

Distribution and trends in Arable Flora

There is an urgent need to focus attention on arable plants in the landscape, in part to reflect their continued rarity in Britain, but also to reflect the key role that they play in supporting insect and bird populations in their position at the base of the food chain. Although the total area of arable cropping has increased in the post war period, the expansion of winter wheat cropping at the expense of winter and spring oats and barley has reduced the diversity of crop habitats. This, coupled with the earlier sowing and more intensive husbandry of cereals, has been the cause of the severe decline in arable flora.

Table 4. Worcestershire records for five rare arable flora species. Source: Worcestershire Flora Project.

Species	Worcs records 1970 onwards	Comments
Cornflower (UK BAP, IUCN Red List)	10	There are 47 records in total, but most are newly sown introductions. No site produces regular plants.
Corn Buttercup (IUCN Red List)	74	Regularly seen apart form in the NW of the county, but often irregular in any one site.
Red Hemp Nettle (UK BAP, Nationally Scarce, IUCN Red List)	6	In serious decline, last sighting in 1992.
Shepherds Needle (UK BAP, IUCN Red List)	14	Largely in the SE of the county.
Spreading Hedge Parsley (UK BAP, Nationally Scarce, IUCN Red List)	30	All records in the south of the county.

2.4 Legislation affecting the arable habitat

Single Farm Payment

In 2005, the Single Farm Payment (SFP) replaced most existing crop and livestock payments and broke the link between production and grant support. To receive the SFP farmers/land managers must demonstrate Cross Compliance: that they are keeping land in Good Agricultural and Environmental Condition (GAEC), which includes soil management and protection and the maintenance of habitats and landscape features, and complying with a number of specific Statutory Management Requirements (SMR's) relating to the environment, public and plant health and welfare, and livestock identification and tracing. The Cross Compliance regulations bring together under one umbrella several major pieces of legislation and apply them specifically to the farm environment. Some of these are discussed in more detail below.

Other key legislation

Under the Food and Environment Protection Act 1985, it is illegal to spray herbicides into hedge bases. Certain pesticides have an aquatic buffer zone requirement when applied by horizontal boom or broadcast air-assisted sprayers. If a farmer wants to reduce this aquatic buffer zone, there is a legal obligation to carry out and record a Local Environment Risk Assessment for Pesticides (LERAP). The farmer is legally obliged to record all spraying decisions in his spray records, as advised in section 6 of the updated Code of Practice for Using Plant Protection Products (keeping spray records) (originally in Part 4 of the Code of Practice for the Safe Use of Pesticides on Farms and Holdings (Green Code)).

Twelve species of arable plants receive full protection under Schedule 8 of the Wildlife and Countryside Act, whilst a total of 12 vascular plants (including Western Ramping Fumitory) have been regarded as priority species under the UK BAP. In addition to individual species receiving structured conservation action, arable plants as a whole are included under target 6 of the Global Strategy for Plant Protection. It states that at least 30% of production lands

should be managed in a way consistent with the conservation of plant diversity by 2010.

2.5 Summary of important sites for arable flora

Kemerton

Kemerton Estate is the family home of Adrian Darby, chair of Plantlife from 1994-2002 and is the base of the Kemerton Conservation Trust. Since the 1970s the farm has been managed increasingly along nature conservation lines. The farm is in Countryside Stewardship and there have been arable margins and conservation headlands for over 20 years, supporting expanding populations of shepherd's needle, corn buttercup, *Silene noctiflora* night flowering catchfly, narrow fruited cornsalad and many others. A wealth of information has been gathered by the Conservation Trust about management of arable margins and seed propagation.

Lower Smite Farm

The headquarters of Worcestershire Wildlife Trust, Lower Smite is a small mixed farm (65 ha) that seeks to maximise education and biodiversity value whilst at the same time retaining a viable farming unit. The farm is in Countryside Stewardship (CSS) and of primary importance is the retention of a farmland mosaic through an arable rotation of winter wheat, spring barley, winter beans and temporary grass. The farm is of national importance for arable flora and is part of Plantlife's Important Arable Plant Areas Project (see section 4.3). Four 0.5 ha research plots are managed in partnership with Plantlife as part of a project to evaluate the effectiveness of different management strategies, including different cultivation dates, cultivated margins, fallow plots and conservation headlands, in conserving and encouraging rare arable flora. Key species present include corn buttercup, *Ranunculus parviflorus* small flowered buttercup, *Myosurus minimus* mousetail and *Torilis arvensis* spreading hedge parsley. WWT has also established a further 2 ha of arable flora margins and in-crop conservation headlands as part of the existing CSS agreement.

Naunton Beauchamp (Naunton Court)

In autumn 2006 Worcestershire Wildlife Trust acquired two arable fields previously belonging to Naunton Court. The importance of the site was first recognised in 1990 with corn buttercup recorded as very common, shepherds needle as common and *Lithospermum arvense* field gromwell as fairly common. A further survey in 2001 showed all three species were still present though in reduced numbers. The site is of international importance under the Plantlife criteria for identifying Important Arable Plant Areas. The 2007 survey following WWT's purchase of the land has been very encouraging, although field gromwell has not yet been re-found. Other species of importance in the immediate area surrounding the two fields are *Anthemis cotula* stinking chamomile, *Euphorbia exigua* dwarf spurge, *Kickxia spuria* round leaved fluellen and *Kickxia elatine* sharp leaved fluellen.

The site is now being sympathetically managed for arable flora with a sympathetic neighbouring farmer carrying out all operations. Management strategies include conservation headlands, autumn sown crops, low input crops and rotational fallow.

Other important county sites for arable flora

An analysis of county arable flora records on behalf of Plantlife showed about 50 1km squares which would qualify as nationally important if each monad were a single arable site. Many of the areas identified have a good remnant seed bank and would produce notable arable sites if subjected to appropriate management. In addition to those listed separately above, some of the most notable of these sites include:

- Larford (SO8169, SO8168), south of Stourport
- Gadfield Elm (SO7831) in the extreme south west of the county near Redmarley D'Abitot
- A cluster of sites between Honeybourne, Bretforton and the Littletons near Evesham (SP1145, SP0946, SP1045, SP1043).

3. Current factors affecting biodiversity within the arable habitat

- The need for crops to be weed-free leads to widespread adoption of broad-spectrum herbicides, as weeds can affect yield, their seed can contaminate the harvested grain and result in penalties and they can host disease that can be transferred to the crop (e.g. ergot).
- Lack of selective herbicide trials work and an overall lack of selective herbicides available, which would allow more selective use of herbicides in crops known to have specific arable flora.
- Use of insecticides, such as seed dressings and soil applications, sprayed directly onto the crop.
- Use of molluscides (slug pellets).
- Predominance of winter cropping resulting in competitive crops that allow increasingly less light through the canopy from early spring.
- High nitrogen requirement crops.
- Less spring cropping.
- Autumn ploughing of stubbles.
- Field drainage (e.g. a reduction in wet areas).
- Whole field applications of lime/base fertiliser altering soil/habitats.
- Deep cultivations/subsoiling affecting individual species requirements.
- Lack of information / knowledge on arable flora species.
- Grain storage.
- Climate changes encouraging winter cropping in favour of spring.
- The reduction in the compulsory set aside rate to zero for the 2008 cropping year.
- The development of the biofuel sector and the potential loss of marginal land to crop production for biomass.

4. Current Action

4.1 Local protection

Arable land itself receives no legal protection per se aside from the legislation outlined above pertaining to the management of it. At the time of writing there are 221 Countryside Stewardship and 548 Environmental Stewardship agreements underway on landholdings in Worcestershire, which will afford protection via sensitive management to specific features and habitats on each farm.

4.2 Habitat management and programmes of action

Environmental Stewardship schemes

Agri-environment schemes were first introduced in the 1980's with the current two-tier Environmental Stewardship (ES) scheme launched in 2005. To date around 28,000 Entry Level Stewardship (ELS) agreements have been signed nationally, bringing some 4 million hectares under environmental management (Source: Defra). Farmers receive an area payment of £30/ha across their whole farm, which increases to £60/ha under the Organic ELS scheme, in return for which they must implement certain environmental management options. *Note: The ELS was closed in December 07 and re-opened in January 08 with the four management plans removed (Soil, Nutrient, Manure and Crop Protection).*

Early data on option uptake under ELS confirms that several options are being taken up by a large proportion of participants: current agreements reveal a strong preference for hedgerow management options with a significantly lower uptake of margin, and more importantly, cropped area management options (RDS, 2006). Whilst ELS continues to be successful in bringing large numbers of farms into low-level environmental management, on their own grass margin and hedgerow management options do little to offset risk to many species of high conservation concern (Butler *et al,* 2007).

Higher Level Stewardship (HLS) is a much more competitive, targeted scheme and supports only the highest quality applications. There are currently almost 1,000 HLS agreements in England covering over 65,000 hectares. HLS will now be increasingly targeted geographically at high value habitats and species where it is considered that maximum biodiversity and landscape benefit can be gained.

There is a view that the use of farmland birds as the biodiversity indicator for arable landscapes is distorting our understanding of the impact of agri-environment schemes on biodiversity in general (Plantlife). It is assumed that, as birds sit near the top of the food chain, an increase in their numbers will reflect an increase in all plants and animals below them in the chain (in other words an all-round healthy farming environment). However, the use of sown wild birdseed mixes, as well as pollen and nectar mixes (for insects), is distorting the picture on the ground. Food can be provided to increase bird numbers within the arable farming environment without necessarily greatly improving the overall biodiversity of the landscape and the arable plant populations. Similar issues occur with sowing wildflower seed mixes as a 'quick fix' for biodiversity. The sowing of wild plant seed masks the natural distribution of species and is an expensive and unnecessary replacement for natural regeneration.

The government has set a target to maintain, improve and restore by management the biodiversity of 15,000 ha of cereal field margins on appropriate soil types in the UK by 2010. If this is to be achieved the uptake of cultivated margin options in Environmental Stewardship needs to be greatly encouraged.

Plantlife has made the following recommendations for improvements to the ES scheme:

- Future reviews of available Stewardship schemes should require land managers to select effective in-field options in key arable plant areas.

- Stewardship payments should be reviewed and increased to encourage uptake of key cultivated margin options and reflect the increased management burden on the farmer and high value to biodiversity.

4.3 Survey, research and monitoring

Plantlife

Current estimates put the rate of loss of arable flora species as high as one plant per county every two years. Plantlife launched the Back from the Brink programme in 1991 in response to the crisis of wild-plant loss in Britain. They have developed a methodology to assess the importance of particular sites for arable species. The Important Arable Plant Areas methodology (Byfield & Wilson, 2005) is derived from the internationally recognised Important Plant Areas (IPA) model (Anderson, 2002) and assesses arable sites based on the presence of either a single threatened species and/or exceptional assemblages of arable species. The 'outstanding assemblages' criterion assesses sites based on a scoring system that tallies the individual score of 120 indicator species present, weighted according to their rarity and decline across Britain, and allows botanists, conservationists and others to instantly assess the value of a site – be it of county, national or European importance.

The Plantlife Arable Plants Project, funded by the Esmee Fairbairn Foundation and Natural England, is to identify and develop an inventory of Important Arable Plant Areas in the UK and to implement a programme to conserve the best sites. Plantlife are currently running Phase II of the project in partnership with FWAG, targeting farms identified as Important Arable Plant Areas and advising them to choose the appropriate arable options within Entry and Higher Level Stewardship. Under the co-ordination of an Arable Plants Officer, FWAG officers in five arable flora-rich rich counties (Wiltshire, Hampshire, Cornwall, Worcestershire, Cambridge/Herefordshire) will target a total of 50 species-rich farms throughout the course of the two-year project (ending October 2007).

In addition to providing targeted advice and training events, other project aims include monitoring how effective the ES schemes are at conserving plants and to look at how problem weeds can be controlled effectively. This experimental work is being carried out at Plantlife's reserve farm, Ranscombe in Kent, and also in partnership with Worcestershire Wildlife Trust at Lower Smite Farm. Although Environmental Stewardship, especially the Entry Level Scheme, focuses on arable plant conservation at field margins, environmental management on a much wider field or farm scale setting could deliver more. Part of this project is to look to find locations and build partnerships where such whole farm scale conservation can be practiced. Plantlife and FWAG will both continue to monitor the new Stewardship schemes in these early years ready to make the necessary representations on policy when the scheme is reviewed.

Worcestershire Flora Project

The Worcestershire Flora Project was initiated by John Day and Roger Maskew in 1987 with the aim of developing a clear understanding of vascular plant distribution in Greater Worcestershire (the current county plus all of VC 37). The previous county flora was written in 1909, so published information was very outdated. Recording was carried out on a tetrad basis for commoner plants (596 tetrads), with more detailed recording for locally scarce and rare plants. General recording was carried out to the end of 2004 with limited extra recording of critical

taxa since. Publication of the results will be in 2 or 3 years, dependent on time and resources. Amongst the results already available is a database of more than 600,000 plant records. Worcestershire is now one of the better-researched counties in the UK for plant distribution.

The State of the UK's Invertebrate Fauna
This Buglife project, currently in development, will draw together new and existing information to provide a comprehensive snapshot of the current state of the UK's invertebrate fauna.

Rothamsted Research
The Department of Plant and Invertebrate Ecology at Rothamsted is undertaking several ongoing research programmes to integrate research on the ecology, behaviour and genetics of organisms inhabiting agricultural ecosystems in order to conserve and exploit biodiversity, monitor and predict the impacts of environmental change, and optimise the performance of both chemical and non-chemical components of crop protection strategies.

5. Associated Plans
Farmland Birds, Ancient / Species-rich Hedgerows.

6. Vision Statement
To raise the profile of arable land as a potentially valuable habitat, changing the perception that arable land equates automatically to a wildlife desert, and making space within our farmed landscape for its characteristic plants, animals, birds and insects.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Expansion	Expand the area of arable field margin within the county by 125ha	190ha	315ha	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC ARA CA 01	**2.1**	Promote and market Lower Smite Farm and Naunton Court as demonstration sites for arable flora conservation.	Worcestershire	2017	WWT	Plantlife
WRC ARA CA 02	**2.15**	Run 5 training events on arable flora ID and conservation for nature conservation staff.	Worcestershire	2017	WWT	FWAG
WRC ARA CA 03	**2.15**	Run 5 training events on arable flora ID and conservation for landowners.	Worcestershire	2017	FWAG	NFU WWT Plantlife
WRC ARA CP 01	**3.16**	10 articles to appear in appropriate magazines, papers and other publications to raise the profile of arable flora conservation.	Worcestershire	2017	FWAG	NFU WWT

WWT – Worcestershire Wildlife Trust **FWAG** – Farming and Wildlife Advisory Group **NFU** – National Farmers Union

References and further information

Boatman, N.D et al ; Evidence for the indirect effect of pesticides on farmland birds; Ibis (2004), 146 (Suppl.2), 131 – 143

Butler, S., Vickery, J and Norris, K. (2007). *A risk assessment framework for evaluating progress towards sustainability targets.* Aspects of Applied Biology 81, Delivering Arable Biodiversity Conference (Association of Applied Biologists) 23-25 January 2007.

Byfield, A.J and Wilson, P.J (2005). *Important Arable Plant Areas: identifying priority sites for arable plant conservation in the United Kingdom.* Plantlife International, Salisbury, UK.

Defra (2007). *Wild bird indicators for the English regions 1994-2005.* Department for Environment, Food and Rural Affairs. http://www.defra.gov.uk/environment/statistics/wildlife/research/download/wdbrds200703.pdf

Department for Environment, Food and Rural Affairs and the Forestry Commission **Departmental Report 2006:** http://www.defra.gov.uk/corporate/deprep/2006/2006deptreport.pdf

Plantlife Arable Plants Project - www.arableplants.org.uk

Still, K and Byfield, A.J (2007). *New Priorities for Arable Plant Conservation.* Plantlife International, Salisbury, UK.

Walker, K.J., Critchley, C.N.R, Sherwood,A.J., Large, R., Nuttall, P., Hulmes, S., Rose, R., Moy, I.,Towers, J., Hadden, R., Larbalestier, J., Smith, A., Mountford, J.O. & Fowbert, J.A. (2006). *Cereal Field Margin Evaluation. Phase 3. Evaluation of Agri-environment Cultivated Options in England: Effectiveness of new agri-environment schemes in conserving arable plants in intensively farmed landscapes.* ADAS, CEH and DEFRA.

Winspear,R and Davies,G (2005), A management guide to the birds of lowland farmland; The RSPB, Sandy

Worcestershire Recorders (Breeding Farmland Bird Survey and Mammal Atlas) – www.wbrc.org.uk. The Worcestershire Record, the journal of the Worcestershire Recorders, is also published in full on this website.

www.buglife.org.uk

Traditional Orchards Habitat Action Plan

1. Introduction

Traditional orchards were once a common feature of the Worcestershire landscape and along with the neighbouring counties of Herefordshire and Gloucestershire made up a significant part of the national orchard stock. Whilst exact figures are hard to find it is thought that upwards of 85% of Worcestershire's traditional orchards have been lost in the last 100 years.

The high importance of traditional orchards as a habitat and the significance of the threat to them have now been recognized nationally and in October 2007 they were listed as a UK BAP priority habitat.

2. Current Status

2.1 Description of habitat

Habitat structure rather than vegetation type, topography or soils is the defining feature of this habitat. Traditional orchards are a group of standard fruit trees planted on permanent grassland. Historically they were planted in a wide variety of situations and soil types for the production of a range of fruits. There is an immense range of local varieties of apples, plums and pears, many of them originating in Worcestershire. These cultivars are an important element of the biodiversity and heritage of the county.

Traditional standard orchards, whilst an 'artificial' habitat, support many features which make them of value for wildlife. The trees are relatively short-lived and as a consequence produce decaying wood more quickly than most native hardwoods making them important refuges for saproxylic invertebrates and hole-nesting and insectivorous birds. The trees are also valuable hosts for mistletoe and lichens. Worcestershire is one of the national strongholds for mistletoe, which is declining as old orchards disappear.

The fruits can provide important food sources in autumn and winter for birds - thrushes in particular being attracted to windfall apples - and, in their decaying state, insects, especially hymenoptera and lepidoptera. Blossom is an important nectar source for invertebrates.

Orchards may also have a herb-rich grassland sward, which may be managed as a meadow or pasture. Shadier orchards can give rise to ranker communities if under-managed that is more typical of hedge bank flora.

Modern commercial orchards are intensively managed, with trees being regularly replaced, the ground beneath the trees being a sterile strip and the intervening grass closely mown. Pesticide use is also heavy. Consequently, they are of negligible value for wildlife, but can be improved with integrated crop management with hedgerows and windbreaks.

2.2 Distribution and extent

Historically, the main concentrations of orchards have been in Kent, Devon, Somerset and the three counties of Gloucestershire, Herefordshire and Worcestershire, although the types of fruit grown has varied widely between and within these areas.

In Worcestershire, there are or have been concentrations of orchards in the Teme Valley, the Severn Vale, the Vale of Evesham, and the Wyre Forest. The legacy of this orcharding past is apparent in much of the county's heritage. Pershore - 'Pearshore' - was the heart of pear growing country. Worcester City has many cultural associations with fruit trees and orchards. The city crest itself incorporates three black pears as do the emblems of the cricket club and Rugby team.

What remains of Worcestershire's traditional orchards represents an important resource, although its precise extent is difficult to document as many surviving traditional orchards are no longer associated with productive agriculture or horticulture and thus will not appear in land use census figures. Figures provided by Natural England extracted from Ordnance Survey data and the 2000 Agriculture Census suggest an estimated area of traditional orchard in the county of 2,236 hectares.

2.3 Legislation

Site of Special Scientific Interest (SSSI): The main protection for orchards is as part of a SSSI designation. However few orchards fall within SSSIs and beyond this there is little or no protection on the majority of orchards.

Tree Preservation Orders (TPO): TPOs can be used by Local Authorities to protect fruit trees where it is in the interests of amenity to do so. TPOs can thus be used to protect fruit trees in relic orchards that are no longer cultivated for fruit production (the trees can be pruned in accordance with good agricultural practice).

Development proposals: Where development is proposed it is possible to include existing orchards within the site into proposed public open space.

A Planning Authority could identify and acknowledge old orchards as characteristic elements of a Conservation Area in Conservation Area Statements.

Local Planning Authorities can use existing Local Area Plan Policies for the protection of landscape character, Conservation Area character and amenity open space, to cover those orchards identified as important in Supplementary Planning Guidance.

Village Design Statements and Parish Plans: Inclusion in these documents will highlight the importance of an orchard for wildlife and local distinctiveness.

Local Nature Reserves: An orchard could be declared a Local Nature Reserve by Natural England or an orchard could be protected as an element within a Local Nature Reserve. This is useful particularly in urban situations.

2.4 Summary of important sites
Some examples include:

- Cleeve Prior Community Orchard and Parish Ponds
- Daffurn's Community Orchard - Kemerton Conservation Trust
- The Knapp - within Worcestershire Wildlife Trust reserve / SSSI
- Lark Hill Orchard - urban site within Worcester
- The Lillans - Kemerton Conservation Trust
- Melrose Farm - SSSI for unimproved grassland flora
- Mutlows Orchard - SSSI for unimproved grassland flora
- Rough Hill Orchard – owned and managed by People's Trust for Endangered Species
- Tiddesley Wood Plum orchard – part of Worcestershire Wildlife Trust reserve
- Wyre Forest - many orchards within the SSSI boundary

3. Current factors affecting habitat

Traditional orchards have been victims of the global change in agricultural economics that has seen them rendered economically unviable, as mass-produced, imported fruit has taken over the market. As a result many orchards have been grubbed out or fallen into decline. Those that remain face a range of threats:

- Gradual decline through neglect: many orchards are in a derelict state and as trees finally die they are not replaced.

- Traditional orchards can be threatened by development. A large proportion of the surviving orchards exist around villages or close to farmsteads and small-scale infill housing development is threatening these remaining orchards.

- Traditional orchards are threatened by agricultural 'intensification**'.** This has caused the single greatest loss by far. Most of the traditional orchards that were vulnerable to loss in this way have been destroyed already, but some are still at risk e.g. when farms change ownership.

- Conflict between commercial and conservation objectives in the management of traditional orchards, as some of the features which are of most benefit to wildlife, particularly dead wood, can be damaging to fruit production.

- The cost of achieving and maintaining organic status of traditional orchards can be prohibitive in combination with the ongoing costs of management, as together these often exceed the value of the fruit produced.

The underlying cause of most destruction and neglect is the loss of the commercial value of traditional orchards. Compared with modern bush orchards, standard trees are less economic to harvest and more susceptible to pests and diseases. As a result most markets have been lost, although traditional orchards can still be valuable as a source of cider, apple juice and perry. However, if an integrated, mixed system of farming is implemented with under-grazing by cattle or sheep, traditional orchards can be viable especially if organic status is gained. This position will only

be strengthened as the oil to transport imported goods increases in price, and the wages of immigrant laborers also rise.

4. Current action

The options for maintaining and creating traditional orchards are highly limited due to the limited drivers and tools to make it happen.

4.1 Local protection

Several sites fall within SSSIs or Special Wildlife Sites designated for other values associated with the site, particularly unimproved pasture. However, the Wyre Forest SSSI includes several orchards specifically included for the presence of old fruit trees.

4.2 Habitat management and programmes of action

Interest has been generated by Common Ground via its publication *Orchards* (2000) and associated initiatives such as the promotion of community orchards and apple days.

The Kemerton Conservation Trust, working closely with local community groups such as the Kemerton Orchard Workers, currently owns and manages a number of traditional orchards and has built up a collection of around 200 varieties of fruit. The Trust hosts several events each year providing training and raising awareness of orchard management techniques.

The Marcher Apple Network was formed by a group of people living in and around the Welsh Marches, to try to ensure the conservation of old varieties of apples and pears and to stimulate public interest in them. They offer assistance in identifying old varieties, propagate new trees of old varieties and assist with the establishment of traditional orchards where specimen trees of may be planted and managed and organise events that celebrate and encourage the revival of interest in traditional fruit varieties.

The National Perry Pear Collection at the Three Counties Show Ground was created in partnership between the County Council, the Three Counties Cider & Perry Association, the Three Counties Agricultural Society and local experts.

Worcestershire County Council offers traditional varieties of apples, pears and plums for sale to the public through their Heritage fruit tree scheme. Different local varieties are offered each year.

4.3 Survey, research and monitoring

In the past local surveys of orchards have been encouraged by Common Ground. One has taken place at Salford Priors and Worcester City Council carried out one within Worcester City. Apart from a partial survey of certain parishes conducted by Tree Wardens there has been no attempt to survey the scale of the resource in the county as a whole. The Peoples Trust for Endangered Species is running a survey scheme of old orchards searching for the noble chafer beetle.

The Worcestershire Habitat Inventory is due for completion in April 2008 and this will provide a complete habitat map of current land use within the county. It will provide a more accurate figure for the existing traditional orchard resource.

The 'Grow with Wyre' landscape scheme began in mid-2007 and aims to restore the special landscape and celebrate the rich working history of the Wyre Forest area. Orchards are one of the priority landscape and wildlife features and restoration projects will start in 2008.

5. Associated plans

Lowland wood-pasture and veteran trees, Urban, Semi-natural Grassland, Ancient / Species-rich Hedgerows, Noble Chafer.

6. Vision Statement

To seek where possible to preserve existing traditional orchards and create new ones by encouraging the planting of local varieties.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Achieve condition	75% of sites identified and selected as Special Wildlife Sites will be in favourable condition according to national orchard BAP criteria	0%	75%	2017
Maintain	Maintain 2300ha of existing habitat	2300ha	2300ha	2017
Restore	Restore 87ha of habitat	0	87	2017
Expand	Create 120 ha of traditional orchard	2300 ha	2420 ha	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Supporting Organisations
WRC TOR CA 01	**2.1**	Develop orchard / orchard restoration sites to become a demonstration site.	Hornhill orchard	2010	WCC	
WRC TOR CA 01	**2.1**	Develop orchard / orchard restoration sites to become a demonstration site.	Knapp & Papermill	2010	WWT	
WRC TOR CA 01	**2.1**	Develop orchard / orchard restoration sites to become a demonstration site.	Daffurn's orchard Kemerton	2010	KCT	KOW
WRC TOR CA 02	**2.12**	Offer advice service to those interested in orchard management / creation / restoration.	Worcestershire	2017	WCC	WWT
WRC TOR CA 03	**2.15**	Deliver annual training courses and workshops on a range of orchard related subjects.	Worcestershire	2017	WCC	WWT KOW
WRC TOR CP 01	**3.4**	Deliver annual apple day and orchard promotion events.	Worcestershire	2017	WCC	
WRC TOR CP 02	**3.4**	Deliver annual apple day and orchard promotion event.	Hanbury Hall	2017	NT	
WRC TOR CP 03	**3.5**	Put out two media releases per year on an orchard / fruit theme.	Worcestershire	2017	WCC	

WRC TOR CP 04	**3.15**	Promote the cultivation of local fruit varieties through Fruit Trees for Worcestershire scheme and other promotional activities.	Worcestershire	2017	WCC	WWT
WRC TOR FR 01	**4.13**	Maintain volunteer resource to undertake management of traditional orchard sites.	Worcestershire	2017	WCC	
WRC TOR HC 01	**7.2**	Create new orchard / restore derelict / neglected sites.	Croome Park Hanbury Hall Rosedene	2010	NT	
WRC TOR HC 02	**7.2**	Create new orchard / restore derelict / neglected sites.	Tiddesley Wood Melrose Farm Hill Court Farm and The Blacklands Lower Smite Farm	2011	WWT	
WRC TOR HC 03	**7.2**	Create new orchard / restore derelict / neglected sites.	Hampton Community Orchard Hipton Hill Orchards Earls Lane Orchard	2012	VLHT	
WRC TOR HS 01	**6.1**	Implement favourable management.	The Lillans The Walled Garden Grange Orchard Upstones Orchard	2015	KCT	KOW
WRC TOR SP 01	**11.3**	Develop criteria for selection of traditional orchards as Special Wildlife Sites.	Worcestershire	2009	SWS Partnership*	
WRC TOR SP 02	**11.3**	Identify and select priority traditional orchards as Special Wildlife Sites.	Worcestershire	2013	SWS Partnership*	
WRC TOR SU 01	**13.6**	Encourage and train volunteers in recording of traditional orchards and fruit trees.	Worcestershire	2017	WR	WCC WWT

WCC – Worcestershire County Council **WWT** – Worcestershire Wildlife Trust **KCT** – Kemerton Conservation Trust
VLHT – Vale Landscape Heritage Trust **NT** – National Trust **WR** – Worcestershire Recorders

* The **Worcestershire Special Wildlife Sites Partnership** consists of the following organisations: Bromsgrove District Council, Country Landowners Association, Environment Agency, Farming and Wildlife Advisory Group, Malvern Hills District Council, National Farmers Union, Natural England, Redditch Borough Council, Worcester City Council, Worcestershire County Council, Worcestershire Wildlife Trust, Wychavon District Council, Wyre Forest District Council.

Semi-natural Grassland Habitat Action Plan

Combining lowland dry acid grassland, lowland hay meadows and neutral pastures and lowland calcareous grassland

1. Introduction

Worcestershire primarily contains four UK BAP Priority Habitat semi-natural grassland types, each of which has developed over hundreds and in many cases thousands of years as a result of differing land management, soil and hydrological factors. These grassland types are:

- **Lowland Neutral Hay Meadows and Pastures**, which includes **Lowland Flood Meadows** (an Annex 1 habitat).
- **Lowland Dry Acid Grassland**, which includes some upland communities.
- **Lowland Calcareous Grassland** (an Annex 1 habitat).
- **Wet Grassland**, which has its own Action Plan in the Worcestershire BAP and is therefore not included here.

This Action Plan also contains an additional locally determined (LBAP) Priority Habitat Type: **Old Grassland**.

Road verges and traditional orchards, both of which hold a considerable semi-natural grassland resource, have their own Action Plans in the Worcestershire BAP. Traditional orchards are also Priority Habitat in the UK BAP.

Please note: The Special Wildlife Site Review data used to inform this HAP are from the period 2002 to 2006 inclusive. Areas covered by the review during this period have largely been the more rural parts of the county. It should be borne in mind that factors affecting grasslands in the less rural, suburban and urban areas of the county may differ.

Glossary of terms used in this Action Plan

Semi-natural: 'Natural' or 'native' species composition that has been co-determined by human management.

Unimproved: Grassland that has never received artificial fertilizer, herbicide and/or re-seeding, or that has but is recovered or recovering.

Semi-improved: Grassland that has received some artificial fertilizer, herbicide and/or re-seeding but has retained some semi-natural characteristics.

Improved: Grassland that has received artificial fertilizer, herbicide and/or re-seeding and has retained little or no semi-natural characteristics.

Annex 1 habitat: EU *Habitats Directive* Annex 1 Habitat, i.e. a habitat of European importance.

NVC: National Vegetation Classification (Rodwell *et al* 1992).

UKBAP PH: UK BAP Priority Habitat.

2. Current Status

The 20th century witnessed dramatic losses and degradation of all semi-natural grassland types, including the near eradication of traditional wildflower-rich hay meadows. The following are estimates of losses of this particularly iconic habitat:

95% of lowland meadows lost between 1930 and 1984 (NCC 1984)
97% of lowland meadows lost between 1934 and 1984 (Fuller 1987)

Initially, many hay meadows fell to the plough as motor vehicles replaced draft animals. However the Second World War "Dig for Victory" campaign followed by the unprecedented agricultural change and intensification of the post-war drive for food security and the effects of the Common Agricultural Policy saw the majority of our traditional grasslands disappear. Haymaking, massively vulnerable to the vagaries of the weather, was replaced by silage technologies and our traditional pastures were largely ploughed and converted to arable, re-seeded with agricultural grass mixes or their ecological value was reduced by application of agrochemicals and overseeding to improve grazing and silage production.

Losses continued unabated throughout the 1980s and 1990s. In Worcestershire an estimated 45% of remaining semi-natural grasslands were damaged and 30% completely destroyed between 1975 and 2000, leaving only 25% of remaining unimproved grasslands intact (Stephen 1997, King 2004).

In 2004 England's remaining 'unimproved' grassland resource was estimated at less than 87,000 hectares (King 2004).

2.1 Description of habitat, with distribution and extent of each

Celebrated in science, art, music and literature, wildflower and wildlife rich grasslands have long been regarded as timeless features of the English countryside. Our hay meadows in particular were the lifeblood of British agriculture and commercial activity; providing vital winter food for livestock and draft animals alike.

Semi-natural or traditionally managed grasslands provide a sustainable method of forage production, which although lower yielding than modern short-term sown grasslands are rich in trace elements, can be lower in gut parasites, are more drought tolerant and are therefore likely to be considerably more climate change resilient than modern agricultural grasslands. Traditional grasslands are important wildlife habitats, not just for their diversity of plants but also for their invertebrate, fungal and microbial diversity. They have considerable cultural importance and are more aesthetically pleasing than modern agricultural leys, adding colour and visual diversity to the landscape and contributing to the unique character of our countryside.

2.1.1 Lowland Neutral Hay Meadows and Pastures

The total England resource of unimproved lowland hay meadows and pastures is estimated to be around 7282 ha (Rodwell *et al* 2007). Whilst the total extent of the Worcestershire resource remains unknown, to date approximately 1200 hectares have been surveyed and sites continue to be regularly discovered. Based on these figures it has been estimated that the county supports over 20% of England's remaining resource of this important habitat type.

Sites with the classic hay meadow NVC MG5 community type, *Cynosurus cristatus-Centaurea nigra*: Crested dog's-tail with knapweed swards, are widespread throughout the county with important concentrations in Malvern Chase, the Teme Valley, the southern Wyre Forest, parts of the Clent Hills, the Dodford area, the historic Forest of Feckenham (encompassing most of central and northern Wychavon), and on the Lias Group clays between Pershore and Inkberrow, the Lenches and the fringes of Worcester City. Though the resource is widespread it is fragmented and sites are generally ecologically isolated. Blocks exceeding 10 hectares are unusual, with most sites being less than 5 hectares in extent.

Lowland Flood Meadows

This term refers specifically to a rare type of grassland known as NVC MG4 *Alopecurus pratensis-Sanguisorba officinalis*: Meadow foxtail with great burnet grasslands, which are often referred to as 'Lammas' meadows after their traditional management cycle.

The EU Habitats Directive identifies Lowland Flood Plain meadows as a habitat that is important in a European context. Whilst none of the Worcestershire sites have been chosen as a Special Area for Conservation (SAC) under the Directive, Upton Ham SSSI is a very good example of this habitat. Other examples are very thinly scattered throughout the floodplains of the lower Severn and Avon Vales in the southern half of the county. Surviving sites are found in discrete areas around Evesham, Pershore, Eldersfield, Tewkesbury, Kempsey and Upton-upon-Severn.

Table 1. Neutral grassland NVC communities present in Worcestershire (Button and Day).

NVC community	Distribution
MG3	A rare species-rich grassland type, occurring sparingly on the County's carboniferous deposits.
MG4	Rare. Mainly large traditional flood meadows situated along the Avon and lower Severn floodplain. Traditionally called ham meadows such land was largely managed as common land in Worcestershire.
MG5	Widespread. The naturally occurring grassland type over much of the County and most frequent in the grassland regions on the Triassic Mercia Mudstones and Lias Groups. It is now much reduced by agricultural improvement.
MG8	Very rare. Only small fragments within other unimproved marsh grassland communities. Principally on the alluvial fenlands.

2.1.2 Lowland Calcareous Grassland

The total England resource of unimproved lowland calcareous grassland is estimated to be about 32,000 hectares (Jefferson 1996). The total Worcestershire resource remains unknown, but to date 142 hectares have been surveyed and new sites continue to be discovered. Calcareous grasslands are found on suitable geological strata throughout Worcestershire, although agricultural improvement has meant they are now limited in number and area. Whilst the Worcestershire resource is not a significant amount in a national

context, it has great importance because it encompasses a range of scarce community types.

The following calcareous grassland NVC communities occur in Worcestershire:
CG1: *Festuca ovina-Carlina vulgaris*: Sheep's fescue and carline thistle.
CG3: *Bromus erectus*: Upright brome.
CG4: *Brachipodium pinnatum*: Tor grass.
CG5: *Bromus erectus - Brachipodium pinnatum*: Upright brome and Tor Grass.
CG7: *Festuca ovina-Hieracium pilosella-Thymus praecox/pulegoides*, sheep's fescue, mouse-ear hawkweed and wild thyme / large thyme.

Calcareous grasslands are found in Wychavon District on the Jurassic Oolitic limestones of Bredon Hill and the Cotswold escarpment around Broadway, and on the limestones of the Blue Lias Formation (of the Lias Group) at Wood Norton and Windmill Hill. They are generally found on steep slopes with dry, thin soils and in association with rock exposures. They are characterised by CG3, CG4 and CG5 NVC communities.

Classic Worcestershire calcareous grassland sites also occur in scattered locations along the Silurian limestone ridges that run north from the Malvern Hills via Ankerdine Hill to Abberley Hill, and along the Teme valley. These grasslands occur as traditional meadows and pastures, under old orchards, alongside ancient woodlands and on old quarry sites and spoil heaps. Many have become rank in recent years and are in danger of reversion to woodland. These grasslands are generally CG3. Characteristic species include upright brome, *Inula conyza* ploughman's spikenard, *Helianthemum nummularium* common rock-rose, *Genista tinctoria* dyer's greenweed, S*anguisorba minor* salad burnet, *Anacamptis pyramidalis* pyramidal orchid and *Thymus polytrichus* wild thyme. Sites are generally small, however they tend to be very high quality in a national context, for example Penny Hill Bank and Quarry Farm Meadow SSSIs.

Calcareous grassland areas of no lesser importance include:

- A series of pre-historic earthworks, known as "tumps", in the south and west of the county. The calcareous grassland associated with these tumps supports scarce species such as *Astragalus glycyphyllos* wild liquorice, *Catapodium rigidum* fern grass, *Prunella laciniata* cut-leaved selfheal and *Ophrys apifera* bee orchid.
- The rhaetic escarpment running up the middle of the county east of Worcester.
- Transitions from neutral to calcareous swards on slopes of the lias formations of the Feckenham forest.
- The rather anomalous and isolated occurrence of a calcareous flora with wild thyme, *Galium verum* lady's bedstraw and four uncommon species of thistle on parts of the Malvern Hills and Castlemorton Common.

Table 2. Calcareous grassland NVC communities present in Worcestershire (Button and Day)

NVC community	Distribution
CG1	Very rare within the Limestone districts. Mainly on steep slopes with thin infertile soils.
CG3	Scarce but widespread. Occurs on suitable calcareous soils throughout Worcestershire.

CG4	Rare. Apparently confined to Triassic and Jurassic limestones.
CG5	Rare. Similar sites to CG4.
CG7	Rare. Present on the Silurian, Triassic and Jurassic limestones. Often on the steepest slopes.

2.1.3 Lowland Dry Acid Grassland

This category covers unimproved and semi-improved grasslands on free-draining and often sandy acidic soils.

Around 890 hectares of dry acid grassland were surveyed in Worcestershire during the 1990s (Stephen 1997), however new sites continue to be discovered and the full extent of the resource remains unknown. Acid grasslands are found in the Wyre Forest and Bromsgrove Districts of north Worcestershire and in association with the Malvern Hills. The total lowland dry acid grassland resource for England is currently unknown.

The primary NVC communities occurring in Worcestershire are:

U1: *Festuca ovina-Agrostis capillaris-Rumex acetosella*: Sheep's fescue, common bent and sheeps sorrel.

This occurs on the acid soils of the Malvern Hills and Triassic sandstones of north Worcestershire. It is frequently in a mosaic with other communities dominated by heathland, shrubs or bracken. It is often rather tussocky with a small number of herbs present: sheep's sorrel, *Erodium cicutarium* common stork's-bill, *Galium saxatile* heath bedstraw, *Potentilla erecta* tormentil, *Ornithopus perpusillus* bird's-foot and *Aira praecox* early hair-grass may be common. Some rarer diminutive annuals and spring ephemeral plants do occur with examples including *Potentilla tabernaemontani* spring cinquefoil, c*erastium semidecandrum* little mouse-ear, *Spergularia rubra* sand spurrey and *Filago vulgaris* common cudweed. Mosses and lichens are often common.

U2: *Deschampsia flexuosa* grassland: Wavy hair grass.

This is the most common grassland community amongst heathland, usually where there is no grazing. It occurs on the Malvern Hills, around Kidderminster in places such as Hartlebury Common and Devils Spittleful and in and around the Wyre Forest. Apart from heathland dwarf shrubs, herbs are few with *Plantago coronopus* Buck's-horn plantain, *Rumex acetosella* sheep's sorrel, heath bedstraw and tormentil being the most common.

U4: *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland: sheep's fescue, common bent and heath bedstraw.

This is a community of wetter, higher ground associated with the west of Britain. Herbs are few but include *Campanula rotundifolia* harebell, *Lathyrus linifolius* bitter-vetch and *Viola* spp. violet species (as well as the more common *Trifolium repens* white clover, *Achillea millefolium* yarrow and *Cerastium fontanum* subsp. *scoticum* common mouse-ear. One sub community U4b with *Holcus lanatus* Yorkshire-fog and white clover occurs on acid to neutral ground in the Malvern Hills and north Worcestershire around the Wyre Forest and Clent Hills area.

U20: *Pteridium aquilinum-Galium saxatile* grassland: Bracken and heath bedstraw.

This is the typical bracken dominated community, where bracken cover is more than 25%. The community is common on acid soils, often on steep slopes on sites in north and west Worcestershire. The vegetation may have a range of grasses and herbs or be almost pure bracken.

Worcestershire contains only a small number of acid grassland SSSIs, however the existing SSSIs are generally large in extent, for example the Malvern Hills and Commons and Shadybank, Hollybed and Coombe Green Commons near Welland. Most of the acid grasslands associated with the Malvern Hills are owned and managed by the Malvern Hills Conservators as public open space.

The Triassic sandstones around Kidderminster are of considerable interest, containing significant grassland elements within large heathland sites, for example the Devils Spittleful and Rifle Range SSSI, Hartlebury Common SSSI (which is on post glacial blown sand deposits) and Burlish Top Local Nature Reserve (identified in 2005 as being of SSSI quality (Stephen 2005)), as well as many small, dispersed and generally isolated blocks of old pasture. 19 such sites were surveyed in 2005 and recorded as being of SWS quality, however the majority of sites remain unsurveyed.

Other important sites in North Worcestershire include Penorchard and Spinneyfields nature reserves (Worcestershire Wildlife Trust), Habberley Valley LNR (Wyre Forest District Council), Waseley Hills Country Park (Worcestershire County Council) and the Clent Hills (National Trust) all of which contain areas of acid grassland.

Table 3. Acid grassland NVC communities present in Worcestershire (Button and Day)

NVC community	Distribution
U1	Rare. Generally confined to the hill systems and sandstone districts.
U2	Rare. Mainy confined to the hill systems and small stands.
U4	Rare. Generally confined to the hill systems and sandstone districts.
U5	Very rare. Tiny fragments on hills.
U6	Very rare. Occasional in the Lickey and Malvern Hills.
U16	Very rare. Rock outcrops in the north and west of the County.
U20	Uncommon but widespread on suitable soils in the north and west of the County.

2.1.4 Old Grassland

Worcestershire also contains a considerable, but as yet unquantified, 'old grassland' resource. Old grasslands are defined in this HAP as sub or non-UK BAP Priority Habitat quality grassland that has suffered varying degrees of agricultural 'improvement' but are largely unploughed and are restorable. These grasslands, along with orchard grasslands and road verges, are vitally important elements of our natural heritage that must be recognized as an essential component of our countryside if we are to reverse the decline in biodiversity and restore functioning, dynamic and resilient ecosystems.

In many ways 'old grasslands' are analogous to Planted Ancient Woodland Sites (PAWS); they have remained un-ploughed, in many cases for hundreds of years, and even when considerably improved by agricultural chemical application and/or continuous intensive grazing they may contain important remnant native plant assemblages, intact soil profiles and soil macro and micro-organism communities. They can also provide important and increasingly scarce refuges for waxcap and other grassland fungi assemblages. Old grasslands are a critically important resource in Worcestershire; they are vital as a supporting and buffering semi-natural habitat matrix for our remaining UK BAP quality grasslands (as well as for other important habitat types) and form the primary grassland restoration and enhancement resource.

The Worcestershire Habitat Inventory (WHI) project's aerial photograph interpretation survey of the county, due for completion in April 2008, will for the first time enable quantification of the 'old grassland' resource in Worcestershire.

Table 4. 'Old grassland' NVC communities present in Worcestershire (Button and Day)

NVC community	Distribution
MG1 *Arrhenatherum elatius* grassland: False oat-grass	Widespread and frequent. MG1 can include more species-rich sub-communities and their variants, such as the common knapweed sub-community and field scabious and meadow crane's-bill variants of the red fescue sub-community. MG1 is often restorable to BAP quality grassland types, for example MG4 and MG5, given appropriate changes to management regimes. MG1 is currently the dominant grassland community on road verges.
MG6 *Lolium perenne-Cynosurus cristatus* grassland: Rye grass and crested dog's tail	Widespread and frequent. Generally species-poor and characteristic of agricultural improvement but they tend to be old grassland sites and frequently retain significant interest. MG6 can exhibit some more species-rich sub-communities such as the sweet vernal grass and yellow oat-grass communities in which meadow herbs such as common knapweed, ladies bedstraw and ox-eye daisy have local abundance; especially on ridge and furrow ridge-tops, steep banks or where there is a return to less intensive practices (Rodwell, 1992).
Other NVC communities	Worcestershire's 'old grasslands' contain remnant patches of many of the other NVC acid, neutral and calcareous grassland communities mentioned in this HAP.

2.2 Legislation and policy protection

2.2.1 Legal protection

SSSIs: Grasslands within SSSIs are protected under the Wildlife and Countryside Act 1981 (and amendments).

NERC Act: The Natural Environment and Rural Communities Act 2006 is the overarching legislation that places a statutory duty on all public authorities to "have regard to the purpose of" conserving, restoring and enhancing biodiversity, throughout their functions. This should lead to better consideration of biodiversity on land that is owned or managed by public authorities, including watercourse corridors, the highways and rights of way networks, local authority smallholdings,

schools, parks and other public open spaces, as well as reinforcing biodiversity consideration throughout the planning process.

EIA Regulations: The various EIA Regulations are the transposition of the EU *Environmental Impact Assessment Directive* (1997) into UK law. The Key EIA Regulations that offer varying degrees of protection to grasslands are:

- **EIA (Agriculture) (England) (No.2) Regulations 2006**
- **Town & Country Planning (EIA) (England & Wales) Regulations 1999**
- **EIA (Forestry) (England and Wales) Regulations 1999**

and potentially:

- **EIA (Land Drainage Improvement Works) Regulations 1999**

2.2.2 Policy protection

Government Policy: Working with the Grain of Nature: A Biodiversity Strategy for England lays out the Governments vision for conserving and enhancing biodiversity in England. A key element of the Government vision is for consideration of biodiversity to become embedded within all levels of policy and decision-making and within society as a whole.

The UK BAP: As the Governments response to the UN *Convention on Biological Diversity* (1992) the UK BAP offers considerable policy protection to UK BAP Priority Habitat quality grasslands and BAP species that rely on them. Traditional orchards were granted UK BAP PH status in 2007, thus providing additional policy 'protection' for grasslands associated with traditional orchards.

Planning Policy Guidance: Grasslands that have been designated as SWS and sites that are of SWS quality are 'protected' to a degree by Government planning policy guidance, as reinforced by regional and local planning guidance. Planning policy guidance similarly covers important wider-countryside biodiversity features, for example grassland road verges and other small/remnant areas of semi-natural grassland.

3. Current factors affecting the habitat

During the 20th century the primary mechanisms for loss of traditional lowland grasslands were related to agricultural intensification and production subsidy; the principal causes being ploughing and conversion to arable or re-seeded grass leys, application of agricultural chemicals and neglect of uneconomic and difficult to manage 'marginal' land.

Whilst the pace of outright destruction has reduced considerably since the introduction of the EIA (uncultivated land and semi-natural areas) Regulations (2001) losses continue to be reported. Two sites, one SWS and one Grassland Inventory site, have been destroyed since 2000. It is hoped that recent strengthening of the Regulations, through the EIA (agriculture) Regulations 2006, and changes to planning legislation and guidance will largely prevent further outright destruction of sites, although concerns remain that in Worcestershire the current 2 hectare threshold for EIA applications continues to leave small sites vulnerable to destruction and planning enforcement is largely deficient in the county.

Gradual deterioration of habitat quality remains a critical concern. Lowland neutral meadows and pastures in particular still remain vulnerable to agricultural intensification, especially where they occur on more fertile and better-drained soils where agricultural improvement is more cost-effective and its effects more immediate (Rodwell *et al* 2007). Conversely, the neglect and abandonment of areas that are uneconomical or difficult to farm in a modern agricultural context is also an important factor in grassland loss. During the 2002 to 2006 period of the ongoing SWS Review, 36% (170 hectares) of the 464.5 hectares assessed in the largely rural districts of Wychavon and Malvern Hills were found to have been damaged or destroyed due to extremes of management; i.e. either over-intensive management or neglect.

An increasing trend is the use of semi-natural grasslands for non-agricultural purposes, chiefly horse grazing, which if properly managed can maintain grassland quality, but frequently leads to loss of biodiversity value and in some cases severe damage to or outright destruction of biodiversity interest. Garden extension and incorporation of grassland into the curtilage of converted agricultural buildings are regularly reported. These activities should be prevented, or minimised, by the planning process, however it seems that grassland surveys are not routinely requested by several of Worcestershire's district planning authorities prior to planning decision-making and, as discussed, planning enforcement is largely deficient. Other damaging factors recorded in recent years include off-road vehicle impact, unauthorised/illegal tipping of development waste and soils and inappropriate granting of permissions for dumping of waste and soils. The latter being largely as a result of Environment Agency exemptions and/or poorly worded planning permissions, conditions and informatives.

The following is a list of the principal causes and factors affecting grasslands in Worcestershire:

- **Decline in the economic viability of traditional grasslands.** As low intensity livestock farming becomes increasingly unviable and unappealing this has become the precursor to many of the factors listed below.
- **Change in ownership/tenancy.** ADAS (1992) research into neutral grassland ownership nationally showed that 46.5% of grassland was owned by people aged 60 years or over. This proportion is likely to have increased significantly since the early 1990s. Whilst the research was based on neutral grassland, trends for acid and calcareous grassland are likely to be similar. Experience shows that grasslands are at the greatest threat of damage or destruction by the factors indicated below during change of ownership. The situation is exacerbated by the trends for younger generations to move away from farming and grasslands to be purchased by people who do not possess the knowledge and skills to manage them appropriately.
- **Ploughing: Conversion to temporary ley grasslands or arable.** Historically ploughing has accounted for a significant proportion of destruction of grassland sites, both nationally and in Worcestershire (Stephen, 1997). Whilst it remains a problem, available evidence suggests that ploughing of grasslands has occurred significantly less since

the enacting of the EIA (uncultivated land and semi-natural areas) Regulations (2001) and will continue to decline as a result of the EIA (agriculture) Regulations 2006, as awareness amongst the farming community continues to rise. Nevertheless three sites, two SWS and one Grassland Inventory site, are known to have been badly damaged or destroyed since 2000.

- **Agricultural 'improvement'.** Application of fertilizers, herbicides/pesticides, lime and re-seeding continue to cause deterioration of habitat quality and remain a grave concern. The gradual damage and destruction of biological interest that is caused by these activities is difficult to detect and, as a consequence, the EIA regulations are unlikely to be effective in discouraging this activity.
- **Intensive grazing / over-grazing and inappropriate seasonal grazing**. Over-grazing leads to removal of species from the sward over time and the permanent loss of species that do not have a persistent seed bank. The problem is particularly severe in areas of the county that have experienced considerable expansion of horse ownership.
- **Change of management; meadow management to grazing pasture.** Grazing a hay meadow in spring and summer can result in loss of species diversity through suppression of vegetative growth, flowering and seed setting. Again we are seeing an increase in change of use from agricultural management to horse pasturing, as traditional livestock management becomes less viable and less appealing.
- **Horse grazing**. Conversion to horse pasturage requires a specific mention. Where stocking density is too high and or continuous, and additional appropriate management such as topping and dung clearance is absent, habitat quality tends to be drastically diminished over time (King 2007). Local Planning Authorities and horse owners alike should note that planning permission is required for conversion of agricultural land to horse pasturage.
- **Development and change of use**. Often associated with change of ownership, loss of sites through conversion to domestic gardens, development, and for horse stabling/ménage construction continues to be a problem. Losses to developments granted planning permission are currently unknown.
- **Abandonment, neglect and under-grazing**. General neglect, i.e. lack of management or insufficient management intensity, is a damaging factor that can lead to considerable loss of species and habitat diversity. Invasion by scrub and bracken has caused loss and damage to a substantial number of sites.
- **Unauthorised tipping/importation of waste and soils**. Sites are regularly damaged and destroyed by unauthorized tipping and through ill considered permissive tipping of soils and other waste derived from development and landscaping schemes. The lack of financial support available for the removal of fly-tipped waste on agricultural land is a significant issue.
- **Afforestation**. This continues to cause loss and degradation of sites.
- **Quarrying**. Sites continue to be lost, although these are generally associated with older permissions granted for sand and gravel extraction on the river terraces. Worcestershire County Council, aggregate extractors and landowners must ensure that losses are minimized as far as possible, and that where losses are unavoidable appropriate

restoration is undertaken, taking full advantage of turf translocation, topsoil storage and seed harvesting opportunities. Enhancement opportunities should also be a condition of future permissions.

- **Scarcity of appropriate expertise, livestock and machinery**. The widespread disintegration of the cultural and social fabric associated with traditional farming (Rodwell *et al* 2007) has the knock-on effect of reducing availability of people with appropriate expertise, as well as machinery and livestock that is suited to traditional grassland systems.
- **Loss, lack of availability and low rates of grants**. Withdrawal of Worcestershire County Council's Environmental Improvement, Community Environment and Section 39 Agreement grant schemes has removed the only support available to owners of small meadows, paddocks and horse pastures who are outside of the farming community. The bureaucracy associated with Environmental Stewardship can be off-putting to landowners. Rates of funding are not a sufficient incentive for many owner/occupiers to undertake positive management.
- **Insufficient funds to meet Environmental Stewardship applications**. The level of payments under ES on a unit measure basis represents a substantive improvement on Countryside Stewardship payments. However, limits to current agri-environment scheme resources place a constraint on the number of Higher Level Stewardship applications that can be approved.
- **Fragmentation/isolation and small site size**. The county grassland resource comprises predominantly small and isolated sites; blocks exceeding 10 hectares are unusual; with most sites being less than 5 hectares in extent. As a consequence sites tend to be vulnerable to external factors, remain at high risk of species extinction and have poor climate change resilience. Fragmentation of the resource largely prevents increase in species distribution and recolonisation of locally extinct species. It is hoped that the move away from site focused conservation effort toward landscape scale conservation and enhancement will begin the process of reversing this trend. The importance of non-UK BAP and sub-UK BAP priority quality habitat must be recognized in this context.
- **Recreational pressure.** Deleterious impacts include trial/quad-biking, mini-moped and 4WD vehicle usage, dog walking, horse riding, mountain biking and general visitor pressure.
- **Atmospheric pollution.** The impact of eutrophication caused by atmospheric nitrogen deposition has not been assessed in Worcestershire; however at a national level it is believed that such eutrophication is likely to be a significant factor in grassland deterioration (King 2007).
- **Riverine eutrophication.** Where grasslands are dependant on groundwater or are periodically inundated by floodwater eutrophication caused by agro-chemicals such as phosphorus is likely to be a detrimental factor (Rodwell, 2007).
- **Anoxia** as a result of prolonged flooding and poor surface drainage may increase if flooding frequency and duration continues to increase. Increased frequency of summer flooding events is likely to be particularly damaging, especially during the flowering season.
- **Climate change.** The likely impacts of and resilience of traditional grasslands to climate change remain largely unexplored and unknown. Worcestershire's nationally important neutral lowland meadow and

pasture resource provides a valuable opportunity to identify, monitor and better understand changes that may be the result of climate change.

- **World markets**. The effects of climate change, coupled with increasing population, mean that some areas of the world will be increasingly unable to produce and supply raw food products at required rates. This in turn will dictate the global availability and prices of commodities such as grain, which the British farming industry will be put under pressure to respond to.

4. Current Action

4.1 Local protection

Under the Wildlife and Countryside Act 1981, Natural England is able to notify any sites that meet the SSSI criteria. To date around 460 ha of neutral grassland have been designated as SSSIs in Worcestershire. Whilst this incorporates many of the best grasslands, there are still a number of SSSI quality sites that warrant notification within the county. Special Wildlife Sites are regarded as being of county or regional importance. Currently 802 hectares of grassland have been listed as Special Wildlife Sites, however there are a considerable number of additional grasslands awaiting assessment. Whilst SWS have no statutory status, they are identified in Local Plans and are protected, to a degree, by planning policy and by the various EIA Regulations.

4.2 Habitat management and programmes of action

BAP priority habitat quality grassland is target habitat for Environmental Stewardship (ES). The Entry Level Scheme has various options that will contribute towards the protection and maintenance of semi-natural grassland, including those for the use of low or very low inputs and for the protection of archaeological features, such as ridge and furrow, where cultivation of grassland is undesirable.

The Higher Level Scheme has options for arable reversion to permanent grassland for the purpose of protecting historic features, the maintenance and restoration of traditional water meadows and a range of options for the maintenance, restoration and creation of species-rich semi-natural grassland, wet grassland for the benefit of wading birds and other target grassland for the benefit of key species. There is an option for managing grassland through traditional haymaking.

Since Worcestershire County Council's environmental grant schemes were withdrawn in 2003, financial support has been unavailable and management advice difficult to obtain for the considerable number of important grasslands within the county that are not eligible for Environmental Stewardship. The Herefordshire and Worcestershire Grassland Forum has identified the need for a coordinated grassland conservation initiative, along with a new funding stream, to assist smallholders and others who are outside of the conventional farming community and for whom Environmental Stewardship is unavailable or unattractive.

4.3 Survey, research and monitoring

Worcestershire Wildlife Trust is currently undertaking a complete review of Special Wildlife Sites. Tables 5 to 8 below show trends derived from the review between 2002 and 2006 for grassland sites and sites that contain a grassland component.

Table 5. Key factors affecting grassland sites and mixed habitat sites containing grassland that have been re-listed during the ongoing review of Special Wildlife Sites. Data from the period 2002-2006, supplied by Worcestershire Wildlife Trust.

Grassland Type	No. of sites	Total area assessed (ha)	Total area damaged or destroyed: (ha)	Total intact area (ha) (optimal or sub-optimal/declining) (ha)	Sites in Fair to Good condition	Sites showing Neglect/scrub impact	Sites showing intensive management (agri-chemicals overgrazing etc.)	Estimated area of BAP quality grassland (ha)
Neutral	132	464.42	170.62 (36%)	293.80	49	24	31	280+
Calcareous	14	70.93	14.73 (20%)	56.20	6	3 ?	3?	34+
Acid	9	125.00	-	125.00	9	3	-	125
TOTALS		**660.35**	**185.35 (28%)**	**475.00 (72%)**	64 [50%]	30 [23%]	34 [27%]	439

Table 6. Categories of damage / deterioration / destruction that led to the de-listing of grassland sites during the ongoing SWS review. Date from the period 2002 - 2006.

Cause of damage / deterioration / destruction	No. of sites affected
Management intensification (agri-chemical and/or overgrazing)	13
Neglect / dereliction	6
Ploughing / conversion to arable	1
Total number of grassland sites de-listed as a result of damage / deterioration / destruction.	20

Table 7. Factors affecting 130 grassland Special Wildlife Sites reviewed between 2002 and 2006.

Proportion of re-listed grassland sites that are in near-optimal condition	50%
Proportion of sub-optimal sites affected by over-intensive management (agri-chemicals and/or overgrazing)	27%
Proportion of sub-optimal sites affected by neglect / dereliction	23%
Proportion of sites where damage / destruction is linked with change of owner / tenant / grazier	5%
Proportion of sites destroyed by ploughing	4%

Table 8. Additional data derived from the ongoing SWS Review. Data from the period 2002 - 2006.

Number of re-listed Special Wildlife Sites that contain grassland	75
Sites where deterioration of grassland has led to de-listing (removal of SWS status)	20
Newly listed (but previously recognised) sites that contain grassland.	27
Newly listed sites (not previously recognised) that contain grassland	7

Explanation of the Special Wildlife Site Review data and trends:
***Sites that have been severely damaged or destroyed**:* There are 20 sites where grassland loss has resulted in de-listing of the SWS (this is distinct from sites where the grassland component has been lost, but the site has been retained as a SWS as the other habitats present remain of SWS quality). 13 of the de-listings were due to intensive management (overgrazing and/ or fertilizer use), 6 were due to neglect/dereliction and 1 was due to conversion of the site to arable land / tillage.

***Site Condition Figures**:* Only 50% of the re-listed sites can be said to be in optimal or near-optimal condition. The proportion of sites suffering from over-intensive management (27%) is marginally higher than the proportion suffering from neglect (23%).

***Change of owner/tenant/grazier**:* 4 sites out of the 130 reviewed so far have experienced damage or total destruction as a result of changes in ownership, though a further 4 are at risk as a result of recent changes in owner or manager.

***Sites that have been totally destroyed by ploughing**:* Now uncommon occurrences, 3 of the reviewed sites were destroyed by ploughing. Two of these incidents took place before introduction of 2002 EIA regulations; a third will be re-instated under the regulations, though legal action is unlikely. The destruction of one other (non-SWS) grassland resulted in a successful prosecution under the 2002 regulations.

***The Period during which losses and declines have occurred**:* All of the 30% (185^{+} hectares) of SWS grassland found to be damaged or destroyed were damaged/destroyed during the 15-year period since the last major survey of grasslands in Worcestershire.

5. Associated Plans
Wet Grassland; Traditional Orchards; Road Verges; Lowland Heathland; Slow-Worm; Hornet Robberfly; Policy, Grants and Legislation.

6. Vision
6.1 Vision Statement
To achieve an economically and ecologically sustainable future for Worcestershire's biodiverse grassland heritage.

A county where the historically rich grassland resource is sustained, restored and enhanced by well-informed landowners, land managers and land use decision-makers; and cherished by the people of Worcestershire and visitors alike.

Where carefully targeted opportunities for grassland creation are used to strengthen the integrity of the existing grassland resource within a biodiverse landscape that is resilient to climate change and other human impacts.

6.2 The key principles for achieving this Vision
The priorities for action should be continuation of appropriate management where it already exists and restoration of sub-UK BAP Priority Habitat quality 'old'/semi-natural grassland, for example:

- Restoration of appropriate management.
- Reversal of neglect/abandonment.
- Restoration of sub-UK BAP quality grassland.

Creation or re-creation should only be undertaken where there is a strong justification for doing so, for example:

- Re-creation of MG4 on floodplains.
- Expansion/buffering/linking of existing sites of high biodiversity value.
- As mitigation/compensation for habitat lost to development.
- To improve the 'quality' of development/urban areas; e.g. habitat creation to improve the biodiversity and visual amenity of development, or to facilitate functioning ecological networks.
- Where grassland creation is the best habitat creation option for a particular site.
- Where adequate aftercare and ongoing management opportunities exist.
- Research.

A key Action within this BAP is to investigate the feasibility and funding possibilities for a grassland project officer post, as a main delivery mechanism for the work needed to achieve BAP targets. It is envisaged that the core aims of the project will be to: reinvigorate and maximise the sustainable economic viability of traditional grasslands (and allied habitats); promote and co-ordinate conservation and enhancement effort; support the owners of less viable grasslands and grasslands that are outside of the farming sector by supporting, expanding and uniting existing projects and networks.

Examples of mechanisms to be investigated include: conservation grade/branding for 'grassland' products; market development and creation (e.g. hay marketing, livestock products marketing, seed harvesting/marketing); consumer awareness-raising; producer training/support; grazing animal, contractor and machinery rings; Environmental Stewardship cooperatives; maximising recreation/tourism potential.

7. Targets

Target Type	Target Text		Baseline value	Target Value	Target Timescale
Maintain extent	Complete review of Special Wildlife Sites		0 sites	550 sites	2009
Maintain extent	Maintain current extent of habitat	Acid	890ha	890ha	2017
		Neutral	1225ha	1225ha	2017
		Calcareous	332ha	332ha	2017
Restoration	Reinstate sustainable management to achieve restoration of sub-UK BAP quality grassland to UK BAP priority habitat quality grassland	Acid	100ha	990ha	2017
		Neutral	300ha	1525ha	2017
		Calcareous	50ha	200ha	2017
Expansion	Create new habitat	Acid	2ha	992ha	2017
		Neutral	66ha	1591ha	2017
		Calcareous	2ha	202ha	2017

8. Actions

Action Code	Action Category	Action Text	Location	Action Timescale	Lead organisation	Supporting Organisations
WRC SNG AP 01	**1.1**	Identify role and key objectives of Herefordshire and Worcestershire Grasslands Forum as informed by priority outputs from LBAP grasslands review.	Worcestershire	2008	NE	Herefordshire and Worcestershire Grasslands Forum
WRC SNG CA 01	**2.11**	Identify and consolidate the available resources that provide advice on management, sources of funding, current data etc on semi-natural grassland with a view to providing landowners with these resources. It is envisaged that the Grassland Forum Project will be a key mechanism in achieving this outcome.	Worcestershire	2008	NE	Herefordshire and Worcestershire Grasslands Forum

WRC SNG CA 02	**2.5**	Review MeadowTalk distribution list and develop electronic database of current contacts.	Worcestershire	2010	WWT	Herefordshire and Worcestershire Grasslands Forum
WRC SNG CP 01	**3.7**	Identify gaps in resource availability and produce / reproduce out of date / missing material. Particular focus to be given to: importance of County Special Wildlife Sites; links to and contacts for local advisers, funders and contractors. It is envisaged that the Grassland Forum Project will be a key mechanism in achieving this outcome.	Worcestershire	2010	NE	SWS Partnership, Herefordshire and Worcestershire Grasslands Forum
WRC SNG CP 02	**3.19**	Development of website to support distribution of information and advice on grassland management. To include development and maintenance of online database of local contractors, skilled labour & machinery. It is envisaged that the Grassland Forum Project will be a key mechanism in achieving this outcome.	Worcestershire	2009	WCC	Herefordshire and Worcestershire Grasslands Forum
WRC SNG CP 03	**3.7**	Create BAP grasslands trail guide ensuring that robust sites are used (e.g. suitable nature reserves) to minimise damage.	Worcestershire	2012	WCC	Herefordshire and Worcestershire Grasslands Forum
WRC SNG FR 01	**4.10**	Investigate scope and produce proposal document for a Biodiversity Partnership small grants fund to support the restoration of or, where appropriate, the creation of grassland sites.	Worcestershire	2009	WCC	WWT, NE
WRC SNG FR 02	**4.11**	Produce joint BAP Partnership or lead partner funded feasibility study and funding strategy for a grassland project officer post. See Section 6 of this Biodiversity Action Plan for more detail.	Worcestershire	2009	NE	Herefordshire and Worcestershire Grasslands Forum**
WRC SNG HC 01	**7.4**	Use Worcestershire Habitat Inventory data to produce site list of unimproved / possibly unimproved grasslands and determine strategy for targeting survey effort and management advice.	Worcestershire	2009	WCC	SWS Partnership, Herefordshire and Worcestershire Grasslands Forum

WRC SNG SP 01	**11.3**	Complete review of grassland Special Wildlife Sites and notify Local Authorities and landowners.	Worcestershire	2009	WWT	SWS Partnership*
WRC SNG SU 01	**13.2**	Approximate the area of 'old grassland' remaining within the county using Worcestershire Habitat Inventory data and undertake targeted survey effort to ascertain the broad quality of the currently unclassified 'old grassland' resource.	Worcestershire	2010	WCC	
WRC SNG SU 02	**13.2**	Undertake targeted survey effort to determine the proportion of the grassland resource that meets UK BAP PH quality criteria.	Worcestershire	2010	WCC	
WRC SNG SU 03	**13.5**	Review existing grassland condition assessment mechanisms and develop an optimum approach for use in Worcestershire to enable grassland restoration project success to be monitored. Ensure reference to best available climate change assessment methods.	Worcestershire	2009-10	WCC	Herefordshire and Worcestershire Grasslands Forum

WWT – Worcestershire Wildlife Trust
WDC – Wychavon District Council
MHDC – Malvern Hills District Council
FWAG – Farming and Wildlife Advisory Group
WWC – Worcestershire County Council
WFDC – Wyre Forest District Council
BDC – Bromsgrove District Council
NE – Natural England
RBC – Redditch Borough Council
WorcCC – Worcester City Council

* The **Worcestershire Special Wildlife Sites Partnership** consists of the following organisations: Bromsgrove District Council, Country Landowners Association, Environment Agency, Farming and Wildlife Advisory Group, Malvern Hills District Council, National Farmers Union, Natural England, Redditch Borough Council, Worcester City Council, Worcestershire County Council, Worcestershire Wildlife Trust, Wychavon District Council, Wyre Forest District Council.

** The **Herefordshire and Worcestershire Grasslands Forum** steering group consists of the following organisations: Farming and Wildlife Advisory Group, Herefordshire Biological Records Centre, Herefordshire County Council, Herefordshire Nature Trust, Natural England, Small Woods Association, Worcestershire Biological Records Centre, Worcestershire County Council, Worcestershire Wildlife Trust.

References and further information

ADAS (1992) *Research into the ownership and management of Worcestershire semi- natural neutral* grasslands. Countryside Commission & English Nature.

Button, N. and Day, J.J. (awaiting publication) *Guidelines for the creation of BAP habitats at mineral sites in Worcestershire*. Worcestershire County Council.

Fuller, R. M. (1987) The changing extent and conservation interest of lowland grasslands in England and Wales: a review of grassland surveys 1930 to 1984. *Biological Conservation* **40**, 281-300.

Jefferson, R. G. and Robertson, H. J. (1996) *English Nature Research Report 169: Lowland Grassland - Wildlife value and conservation status*. English Nature.

King, M. (2004) *England's green unpleasant land? Why urgent action is needed to save England's wild flower grasslands*. Plantlife/The Wildlife Trusts.

Nature Conservancy Council (1984) *Nature Conservation in Great Britain*. Nature Conservancy Council, Peterborough.

Rodwell, J.S., Pigott, C.D., Ratcliffe D.A., Malloch, A.J.C., Birks, H.J.B., Proctor, M.C.F., Shimwell, D.W., Huntley, J.P., Radford, E., Wigginton, M.J., Wilkins, P. (1992) *British plant communities: Volume 3; Grasslands and montane communities*. Cambridge.

Rodwell, J.S., Morgan, V., Jefferson, R.G. and Moss, D. (2007) *JNCC Report No. 394: The European context of British lowland grasslands*. JNCC.

Stephen, K. (1997) *Worcestershire Grasslands Inventory – 1997*. Worcestershire Wildlife Trust.

Stephen, K. (1997) *Report of Botanical Survey*. Worcestershire Wildlife Trust.

Stephen, K. (2005) North Worcestershire Acid Grassland Survey. English Nature.

Lowland Heathland Habitat Action Plan

1. Introduction

Lowland heathland is a priority for nature conservation because it is a rare and threatened habitat. In England only one sixth of the heathland present in 1800 now remains. It is a priority habitat within the UK Biodiversity Action Plan.

2. Current Status

2.1 Description of habitat

Lowland heathland is characterised by the presence of plants such as *Calluna vulgaris* heather, *Ulex minor* dwarf gorse and *Erica tetralix* cross-leaved heath and is generally found below 300 metres in altitude. Areas of good quality habitat should consist of an ericaceous (plants belonging to the heath family) layer of varying heights and structures, some areas of scattered trees and scrub, areas of bare ground, gorse, wet heaths, bogs and open water. The presence and numbers of characteristic birds, reptiles, invertebrates, vascular plants, bryophytes and lichens are important indicators of habitat quality.

2.2 Distribution and extent

The UK has some 58,000 ha of lowland heathland of which the largest proportion (55%) is found in England. The UK has an important proportion (about 20%) of the international total of this habitat. Heathland in Worcestershire was originally derived from woodland clearance. Suitable soils for heathland are distributed across a broad swathe of north Worcestershire, indicating that extensive heathland may once have existed within the County. Lowland heathland now occurs at a number of geographically distinct sites across north Worcestershire. The heaths are linked ecologically and on landscape terms with those in Staffordshire: together they afford the Midlands Plateau Area national significance for lowland heathland habitat.

2.3 Legislation

There is no legislation specifically protecting lowland heathland habitat.

2.4 Summary of important sites

Worcestershire's heathland sites are generally found in urban locations around Kidderminster, Stourport-on Severn and Bewdley. The most important sites are as follows:

Table 1. Significant heathland sites in Worcestershire.

Site		Designations	Ownership	Area
1	Hartlebury Common	SSSI/SWS/ LNR/Common Land	WCC	84ha
2/3	Devil's Spittelful Rifle Range	SSSI/SWS	WWT/ WFDC	50 ha
4	Burlish Top	SWS/LNR	WFDC	25 ha
5	Vicarage Farm Heath	SWS	WFDC	11 ha
6	Lickey Hills Country Park	SWS/CP	BCC	23 ha
7	Kingsford Forest Park	SSSI/SWS/LNR	WCC	20 ha
			TOTAL	213 ha

3. Current Factors Affecting the Habitat

- A severe loss of heathland in the last two centuries has resulted from agricultural improvement, woodland planting and lack of management leading to succession towards woodland.
- The spread of invasive species such as bracken.
- Fire caused by vandalism.
- Erosion caused by recreational use of sites and the illegal use of motorbikes.
- Other anti-social behaviour such as shooting.
- Hartlebury Common contains the only heathland bog in the county, and this has been drying out in recent years. The Common has records for a number of plant species that occur nowhere else in Worcestershire and holds the only record for sundew (*Drosera rotundifolia*), although this is now thought to be extinct.
- Although positive in itself, the recent appearance of species such as woodlark on Worcestershire heaths has necessitated the adjustment of management plans and work programmes.

4. Current Action

4.1 Local protection

The most important heathland sites in Worcestershire are owned and managed by either a conservation body or local authority, including Worcestershire Wildlife Trust, Wyre Forest District Council, Worcestershire County Council and Birmingham City Council. Most of them have SSSI or Special Wildlife Site status and are designated as Local Nature Reserves.

The recent discovery of a previously unknown lowland heathland site within the county has highlighted the necessity of planning for the possibility of further remnant habitat being discovered.

4.2 Habitat management and programmes of action

All the sites listed in section 2.4 are receiving positive heathland management defined by site management plans and through funding from either the organisations that own them or agri-environment schemes.

The Heritage Lottery funded Tomorrow's Heathland Heritage project ran from January 2002 until December 2005. Over £110,000 was spent on capital restoration work on seven heathlands across north Worcestershire through a partnership of the various land managers (Worcestershire Wildlife Trust, English Nature, Wyre Forest District Council, Worcestershire County Council and Birmingham City Council). Work was carried out to enhance both true open heath and degraded heathland that was becoming a mosaic of acid grassland, scrub, gorse and bracken. The project also aimed to foster public understanding, appreciation and enjoyment of heathland assets and win public support for a long term programme of heathland restoration. This was done through a series of public events, the production of a leaflet and information and interpretation panels installed on the sites taking part in the project. All the land managers are continuing with site restoration where there are opportunities to do so. They are also experimenting with sustainable management initiatives. Reintroduction of grazing has been a key initiative on The Devil's Spittleful and Rifle Range Nature Reserves.

Worcestershire Wildlife Trust has recently completed the purchase of Blackstone Farm, a 19ha site adjacent to the Devil's Spittleful and Rifle Range reserves.

Currently under arable crops, there are remnant areas of heathland remaining and the Trust is planning to carry out a study on the feasibility of restoring the site.

The Higher Level Environmental Stewardship Scheme contains options for the maintenance, restoration and creation of lowland heathland habitat. Grants for 100% of the capital costs for preparatory work prior to heathland recreation are available, as well as for supporting actions such as scrub management and installing fencing to enable grazing.

4.3 Survey, research and monitoring

An NVC survey of all the major Worcestershire heathlands was carried out in 1999, and it is aimed to repeat this every ten years. Ad hoc survey work has also been carried out on some sites since 1999 and a programme of monitoring of the Tomorrow's Heathland Heritage funded work has been carried out on Burlish Top Nature Reserve.

Worcestershire Wildlife Trust will be carrying out ecological surveys of Blackstone Farm as part of the feasibility study into the heathland restoration project.

A survey of sites for their suitability for reptiles is currently being undertaken on Devil's Spittleful, Rifle Range, Vicarage Farm, Habberley Valley and Burlish Top nature reserves.

Woodlark populations are now also being monitored on all of the above sites and public access to areas of Rifle Range Nature Reserve is being carefully managed due to the presence of breeding woodlark.

South facing compacted sandy slopes have been created at the Devil's Spittleful and Rifle Range nature reserves to encourage solitary wasps.

Close mowing of the sward to encourage grey hair grass at Burlish Top is also being undertaken.

5. Associated Plans

Adder, Scrub, Woodland, Lowland Dry Acid Grassland.

6. Vision Statement

To protect all heathland by ensuring no further loss or degradation, improve the quality of existing sites through appropriate management and increase the extent of lowland heathland through re-establishing degraded sites and through habitat creation.

Improve the understanding of the status of heathland, through appropriate survey and monitoring and raise awareness of the importance of lowland heathland among the public and decision makers.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Maintain extent	Undertake sustainable favourable management to maintain current extent of lowland heathland sites	213ha	213ha	2017
Expansion	Create 13 hectares of lowland heathland, linking fragmented sites or extending existing heathland	213ha	226ha	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Supporting Organisations
WRC HEA AP 01	**1.1**	Establish a Biodiversity Partnership Heathland Fora Group to promote heathland activity amongst site managers and share best practice. Group to meet at least twice per year.	Worcestershire	2008	WFDC	WWT WCC
WRC HEA CA 01	**2.1**	Site to be promoted and in use as a heathland creation demonstration site.	Blackstone Farm	2012	WWT	WFDC HWEHT
WRC HEA CA 02	**2.5**	Hold an annual community forum to encourage local involvement in the management issues for Burlish Top, Habberley Valley, Vicarage Farm Heath and the Rifle Range Nature Reserve.	Wyre Forest District	2017	WFDC	WWT
WRC HEA CA 03	**2.5**	Hold an annual community forum to encourage local involvement in management issues.	Hartlebury Common	2017	WCC	
WRC HEA CP 01	**3.17**	Bi-annual meeting held with Birchen Coppice School to develop curriculum links to the site and to encourage the school to use the reserve in a responsible manner for everday educational activities. All children to be given an opportunity to visit the site with a Ranger.	Rifle Range Nature Reserve	2017	WFDC	BWC
WRC HEA CP 02	**3.2**	Maintain web and or leaflet based information and on-site information and interpretation panels promoting site to visitors.	Hartlebury Common Kingsford Forest Park	2017	WCC	HWEHT
WRC HEA CP 03	**3.15**	Maintain existing on-site information and interpretation panels.	Lickey Hills Country Park	2017	BCC	

WRC HEA CP 04	**3.7**	Establish Blackstone Picnic Place as a recognised gateway to the Kidderminster heathlands by providing public information on access and biodiversity.	Blackstone Picnic Place	2008	WCC	WWT WFDC
WRC HEA CP 05	**3.7**	Create new information and interpretation panels for Blackstone Farm.	Blackstone Picnic Place	2010	WWT	WCC WFDC HWEHT
WRC HEA CP 06	**3.15**	Carry out six guided walks per year on each site to raise the profile of heathlands as a location for countryside walking.	Rifle Range Nature Reserve Burlish Top	2017	WFDC	
WRC HEA CP 07	**3.15**	Carry out one guided walk every two years to raise the profile of heathlands as a location for countryside walking.	The Devil's Spittleful	2017	WWT	
WRC HEA CP 08	**3.15**	Carry out two guided per year walks to raise the profile of heathlands as a location for countryside walking.	Hartlebury Common	2017	WCC	
WRC HEA CP 09	**3.15**	Carry out six guided walks per year to raise the profile of heathlands as a location for countryside walking.	Lickey Hills Country Park	2017	BCC	
WRC HEA CP 10	**3.5**	Create one press opportunity relating to heathland management per year.	Hartlebury Common	2017	WCC	
WRC HEA CP 10	**3.5**	Create one press opportunity relating to heathland management per year.	Rifle Range, Burlish Top, Vicarage Farm, Habberley Valley	2017	WFDC	
WRC HEA CP 10	**3.5**	Create one press opportunity relating to heathland management per year.	Devil's Spittleful Nature Reserve	2017	WWT	
WRC HEA CP 10	**3.5**	Create one press opportunity relating to heathland management per year.	Lickey Hills Country Park	2008	BCC	
WRC HEA CP 11	**3.2**	Establish a health walks group for local community.	Burlish Top	2010	WFDC	
WRC HEA CP 12	**3.2**	Establish site as a location for a regular formal exercise class / group.	Burlish Top	2008	WFDC	

WRC HEA CP 13	**3.2**	Organise one annual event to encourage the local community to utilise heathlands for commuting / recreation via the regional cycle network	Burlish Top	2017	WFDC	
WRC HEA CP 14	**3.2**	Promote cycling recreation on site through the provision of facilities such as bike stands.	Burlish Top	2008	WFDC	
WRC HEA CP 15	**3.2**	Promote cycling as a means of transport to the site by working with Sustrans to develop local cycling routes that link the Common into the national cycle network.	Hartlebury Common	2008	WCC	
WRC HEA CP 16	**3.7**	Produce leaflet for surrounding households, landowners and businesses on importance of local heathlands.	Hartlebury Common Rifle Range Nature Reserve	2009	WCC WFDC	NE
WRC HEA FR 01	**4.11**	Secure and implement Higher Level Stewardship Grant for capital and revenue funding.	Hartlebury Common	2008	WCC	NE
WRC HEA FR 02	**4.13**	Maintain and develop volunteer resource to undertake conservation management.	Hartlebury Common Lickey Hills Country Park	2017	WCC BCC	
WRC HEA HC 01	**7.4**	Undertake a feasibility study for heathland creation and produce management strategy for doing so.	Blackstone Fields	2008	WWT	HWEHT
WRC HEA HC 02	**7.2**	Secure funding and carry out heathland creation project at Blackstone Farm.	Blackstone Fields	2011	WWT	HWEHT
WRC HEA HC 03	**7.2**	Carry out an ongoing programme of heathland restoration through clearance of scrub and secondary woodland and create habitat corridors where possible to link areas of heath.	Devil's Spittleful reserve Lickey Hills Hartlebury Common Vicarage Farm Heath	2017	WFDC WCC WWT	

WRC HEA HS 04	**6.1**	Carry out annual review of experimental management work on site to identify and implement effective sustainable heathland management methods.	Burlish Top, Rifle Range Nature Reserve, Vicarage Farm Heath, Habberley Valley Hartlebury Common	2017	WCC WFDC	NE
WRC HEA HS 05	**6.11**	On an annual basis, review the impact of recreation on the site and ensure appropriate policies and actions are included within site management plans to mitigate against issues identified.	Rifle Range Nature Reserve Burlish Top Vicarage Farm Heath Hartlebury common	2017	WCC WFDC	NE
WRC HEA RE 01	**10.14**	Heathland Fora Group to produce a research strategy aimed at filling knowledge gaps for key heathland species: adder, woodlark, grey hair grass, solitary wasps, tiger beetles, sundew and nightjar.	Worcestershire	2010	WFDC	WWT WCC
WRC HEA SM 01	**12.1**	Review habitat management works and revise where appropriate if key heathland species is found to be present or if research identifies the potential for it to be present.	Rifle Range Nature Reserve Burlish Top Vicarage Farm Heath The Devil's Spittleful Hartlebury common Lickey Hills Country Park	2017	WCC WWT WFDC BCC	
WRC HEA SU 01	**13.4**	Conduct visitor survey.	Hartlebury Common	2008	WCC	

WRC HEA SU 02	**13.2**	Carry out NVC survey of heathland sites.	Wyre Forest District Hartlebury Common Kingsford Forest Park Devil's Spittleful	2010	WFDC WCC WWT	

WCC – Worcestershire County Council
WWT – Worcestershire Wildlife Trust
WFDC – Wyre Forest District Council
BWC – Bishop's Wood Centre
NE – Natural England
BCC – Birmingham City Council
EA – Environment Agency
HWEHT – Herefordshire and Worcestershire Earth Heritage Trust

References and further information

Preston, A (2005). *Final report of the Tomorrow's Heathland Heritage project*. Available from Worcestershire County Council.

Scrub
Habitat Action Plan

1. Introduction

The conservation value of scrub habitat is largely overlooked, often being regarded as a measure of the abandonment and dereliction of land. However, the varieties of scrub habitats that exist in Britain are essential to a large number of species listed on the UK Biodiversity Action Plan.

2. Current Status

2.1 Description of habitat

The nature of scrub communities has lead to difficulties in defining the limits of what is meant by 'scrub'. Many scrub communities can be considered as 'seral stages in the succession from herbaceous communities to woodland' (Mortimer, 2000). Scrub may occur as primary successions on screes, cliffs and quarries, but is more widely encountered as part of a secondary succession after the abandonment of arable land or the relaxation or cessation of grazing on grassland or heathland.

Most definitions of scrub describe it as vegetation dominated by shrubs or bushes. However, the distinction between shrubs and trees is somewhat arbitrary. The height and growth form of woody species is commonly used to separate shrubs from trees. The definition of scrub given by Barkmann (1990) is therefore typical: 'vegetation 0.5m – 5m high, consisting of woody plants with many stems.'

Scrub can be divided into:

Species-rich scrub

Includes habitats such as *Juniperus communis* juniper scrub and montane scrub (including dwarf shrub species such as *Calluna vulgaris* ling heather, *Empetrum nigrum* crowberry, *Vaccinium myrtillus* bilberry, *V. uliginosum* bog bilberry and other, more localised species) that do not occur in Worcestershire. These are recognised as having intrinsic value in their own right, as opposed to having habitat value only in supporting other species (Milsom *et al*., 2003). There are small pockets of relatively species-rich scrub on Bredon Hill, and a small area in the Cotswolds.

Species-poor scrub

Often overlooked or actively disparaged as a habitat, however it can support a large number of species of conservation interest. Table 1 below shows the importance of scrub for rare and threatened taxa.

Table 1. Numbers of rare and threatened species associated with scrub habitat. Taken from the Scrub Management Handbook (FACT, 2003). Original source of data: Mortimer *et al*, 2000.

Plants	Nationally scarce	44
	Near threatened	9
	Red data book	17
	UK priority BAP	2
	BAP conservation concern	15
Insects	RDB Rare	139
	RDB Vulnerable	55
	RDB Endangered	96
	BAP	62
Birds	UK Priority BAP	13
	BAP Conservation Concern	26

The Scrub Management Handbook also outlines the classifying criteria for determining the nature conservation value of scrub (table 2).

Table 2. Classifying criteria for scrub vegetation of high conservation value. Adapted from Mortimer *et al* (2000).

Criteria	Reason
Species of shrub present	Dominant species of high conservation importance and rarity. Eg Juniper, Box and Downy Willow.
Other species associated with scrub type	Scrub of low botanic interest may be valued for other species such as Nightingale in Blackthorn or lichens on coastal Hazel scrub.
Landscape element within an ecological unit	As a component of an important habitat mosaic, such as the species rich grassland and scrub vegetation of chalk downland or birch and willow at the edge of wet heaths and mires. At altitude, scrub occurs at the interface between woodland and montane heath, and on sheltered coasts, scrub and elfin woodland are part of a natural ecotone.

The various scrub habitats can be considered under the following headings:

Scrub as a habitat on its own where there may be significant invertebrate, mammal or bird interest present, particularly:

- *Crataegus monogyna* hawthorn scrub supports breeding birds such as *Carduelis cannabina* linnet, *Pyrrhula pyrrhula* bullfinch, *Streptopelia turtur* turtle dove, *Sylvia atricapilla* blackcap, *Sylvia communis* whitethroat and *Sylvia curruca* lesser whitethroat: all listed in the UK Biodiversity Action Plan.
- *Prunos spinosa* blackthorn scrub for *Thecla betulae* brown hairstreak butterfly and *Aegithalos caudatus* long-tailed tit.
- Damp *Salix* sp. willow / hawthorn dense scrub for *Luscinia megarhynchos* nightingale.

In each case there will be many other species, especially invertebrates, which would benefit from or depend on this habitat.

Scrub as part of a mosaic, including scrub / wetland mosaics such as scrub on the edge of reedbeds that provide habitat for *Acrocephalus schoenobaenus* sedge warblers and *A. scirpaceus* reed warblers, plus a breeding / resting area for *Lutra lutra* otter, and scrub / heath mosaics that may support turtle dove, *Carduelis flammea* redpoll and *Emberiza citrinella* yellowhammer, plus other Biodiversity Action Plans species. In many cases mosaics have been omitted from notification as Sites of Special Scientific Interest because they were not 'typical' or 'pure' National Vegetation Classification (NVC) communities (Rodwell, 1991).

Scrub as a transition from unimproved grassland through scrub to woodland is one of the major scrub habitats. Often, it is the woodland or the grassland abutting important woodlands that are notified in isolation as SSSIs, so that a significant part of the interest (the scrub transition) receives no protection or management. Many woodland SSSIs rise abruptly from neighbouring farmland, yet much of the faunal interest lies in the woodland scrub edge habitat. Scrub edges also provide a refuge for grassland plant species that are intolerant of grazing.

Scrub as a feature of the overall habitat. For many species scrub is important for some part of their ecology; although they only spend a small amount of time in the scrub, it has a crucial importance. An example would be farmland birds such as *Passer montanus* tree sparrow, which feed in the open but near enough to scrub to be able to retreat if danger threatens. In such cases hedgerows are a major scrub habitat, and significant enhancement can be obtained by widening them. For many grassland butterflies scrub provides important shelter from the prevailing wind and helps maintain a warm micro-climate.

Isolated scrub bushes. Isolated bushes in open sites are often very significant as nest sites for birds such as *Locustella naevia* grasshopper warbler, and as song posts for other species such as *Saxicola torquatus* stonechat and linnet.

2.2 Distribution and extent

The distribution and extent of scrub habitat within Worcestershire is not very well represented. It is difficult to accurately assess the distribution of scrub as it is often present as an ephemeral transition between open habitats and woodland. The boundaries are frequently unclear and remote sensing techniques are unable to define or classify it. Some organisations, such as the Malvern Hills Conservators, monitor the scrub within the boundaries of their jurisdiction and, as of 2005, there was 54.46 ha of scrub present on Castlemorton, Hollybed and Coombe Green Commons.

2.3 Legislation

At present there is no legislation protecting scrub habitat.

2.4 Summary of important sites

The Malvern Hills are important for their scrub-grassland mosaic and also the isolated scrub in open habitats. This site is particularly important for its breeding birds. The Malvern Hills Conservators were established by Act of Parliament and manage around 3000 acres of the hills.

Bredon Hill NNR contains species-rich hawthorn scrub important for its breeding birds and invertebrates.

Grafton Wood SSSI, Trench Wood SSSI, Rabbit Wood SSSI and Roundhill Wood (SO95) are all remnants of the Feckenham Forest and all four sites have an important scrub component to them. Grafton, Roundhill and Rabbit Woods are significant for the presence of the brown hairstreak butterfly, whose population is centred on Grafton Wood and the surrounding farmland hedgerows and woodlands. The butterfly depends on blackthorn scrub on which to lay its eggs and on which the caterpillars feed. Worcestershire Wildlife Trust and Butterfly Conservation manage Grafton Wood jointly as a nature reserve for the butterfly and woodland bird interest. Roundhill Wood is privately owned but the scrub is managed under a coppice regime with advice from Butterfly Conservation volunteers that benefits the brown hairstreak and woodland bird species. Rabbit Wood is also privately owned and coppicing has recently been restarted as part of the SSSI management agreement. The presence of brown hairstreak has recently been confirmed at Trench Wood and has led to plans to expand and manage the blackthorn habitat within the wood. Management of the wooded aspect of this site is currently focused primarily on woodland birds, and in particular scrub warblers.

The scrub / wetland mosaic at **Oakley Pool SSSI** is noted particularly for its scrub willows around the reedbeds.

Hartlebury Common SSSI is a scrub / heath mosaic that was selected for notification as one of the most important areas of dry dwarf shrub heathland surviving in the West Midlands, comprising *Calluna vulgaris* heather, *Erica cinerea* bell heather, *Ulex europaeus* gorse, *Ulex gallii* western gorse and *Cytisus scoparius* broom. Dwarf shrub heath habitat can be important for bryophytes and lichens (Milsom *et al*., 2003). **Kinver Edge SSSI**, part of which falls within Worcestershire, was also selected for its dwarf shrub heath community.

Wyre Forest SSSI contains a transitional mixture of grassland, scrub, and woodland important for breeding birds and invertebrates.

Ipsley Conservation Meadows within the Arrow Valley Country Park in Redditch are important for the species-poor scrub in a mosaic of habitats, which is known for holding numbers of breeding birds and invertebrates.

3. Current factors affecting the habitat

- There is a general lack of awareness of the importance of even species-poor scrub to the nature conservation interest of a site. The presence of scrub is seen as negative on many sites.

- The poor representation of scrub in the SSSI series is a major problem. This is mainly because of the nature of scrub in being a transitional stage between grassland and woodland as part of habitat mosaic, and generally not qualifying for selection in its own right.

- Management for other habitats is often incompatible with the continued presence of scrub and the encroachment of scrub onto other habitats that

are viewed as more important typically leads to the scrub being removed rather than managed for its own sake.

- Grazing needs to be carefully managed on sites with a scrub component. Under grazing speeds succession to woodland, whereas over grazing prevents scrub regeneration and growth.

- Browsing by deer within woodlands and on the woodland edge can have a detrimental effect on regeneration and the structure of scrub / woodland understory habitat.

- There is a lack of scrub creation on land adjacent to woodland or of permitting a scrub woodland edge habitat to develop and remain.

- Lack of knowledge/ surveys about where scrub is in the county, although the production of Farm Environment Records and Farm Environment Plans through the Environmental Stewardship schemes may help with this.

4. Current Action

4.1 Local protection

Although most Sites of Special Scientific Interest (SSSI's) and Special Wildlife Sites (SWS's) in the county will contain scrub, there are no sites designated primarily for the scrub habitats. The SSSI series has been chosen to represent best examples of the major habitat types. Scrub is considered as part of the wider Woodland and Scrub Communities category, using the NVC habitat classification, in the guidelines for the selection of biological SSSIs. The guidelines recognise the significance of coppice woodland and structural diversity within the woodland as a whole as a contributing factor to overall nature conservation value. The desirability of a scrubby woodland edge habitat rather than an abrupt boundary is also stated. Well-developed scrub communities are listed as being a special feature that should be given consideration if present and not already selected on other grounds.

SSSIs can also be selected if they support a good range of bird species characteristic of that habitat and scrub is specifically listed for this purpose as being important for species such as nightingale, grasshopper warbler and *Emberiza cirlus* cirl bunting. The current lack of selection of habitat mosaics is at the detriment to sites important for their invertebrate interest, where species often require different types or structure of habitat throughout their life cycle. Selection can be considered on the presence of nationally or regionally scare, Red Data Book or Schedule 5 (Wildlife and Countryside Act) invertebrate species. In the case of butterflies, habitat mosaics, particularly of grassland, scrub and woodland, are given added weight where these support nationally rare or scare or endemic species or species that have undergone substantial local declines.

Few SSSIs in Worcestershire notified before 1992 mention scrub as a component of the site. More recent notifications, particularly of grasslands, refer to the scrub element. Of the sites listed in section 2.4 the presence of blackthorn scrub at Grafton Wood is included within the SSSI citation. Trench Wood was designated partly because of the woodland bird interest, although those that we would consider to be scrub birds are attributed in the citation to replanted woodland

rather than scrub, and the Oakley Pool citation mentions the presence of breeding grasshopper warbler. The importance of the shrub layer is given as a reason for the notification of Rabbit Wood.

4.2 Habitat management and programmes of action

Most management techniques use rotational methods to diversify the age structure of habitat on a site whilst maintaining current extent. Although this is the most used method in Worcestershire, the Scrub Management Handbook goes into detail about other management techniques such as natural regeneration, planting and layering, livestock grazing and browsing, coppicing and thinning, mowing and flailing, controlled burning, cutting, stump removal and herbicide application. The handbook discusses the implementation of the techniques, the advantages and limitations and describes the potential environmental and non-target impact of each.

Grants are available to landowners under the Environmental Stewardship Schemes. Higher Level includes area payments for the maintenance, restoration and creation of successional areas and scrub, and capital payments for scrub management. The Entry Level Scheme includes options for the management of woodland edges, management of scrub on archaeological sites and field corner management, which could involve scrub habitat.

FWAG can provide landowners with advice on creating and managing scrub habitats.

Although nightingales have been lost as a breeding species in Worcestershire, several sites in the county are being managed to provide suitable areas of scrub should they return. In Grafton Wood two large areas of conifer have been marked for felling; these areas are adjacent to those currently being coppiced. The subsequent regeneration of scrub will provide excellent habitat for many woodland birds, including nightingale, and also for invertebrates. The blackthorn scrub and hedgerows in and around Grafton Wood are also managed on a coppice rotation to benefit the brown hairstreak butterfly, with no more than one third of the blackthorn cut at any one time. Several areas in the wood have also been planted with blackthorn to increase the total habitat available to the butterfly.

Rotational management of the scrub habitat is being carried out on Bredon Hill NNR to diversify the age structure of the species present although the current extent of the scrub is being maintained to save encroachment onto the limestone grassland.

The management regimes undertaken by the Malvern Hills Conservators on the hills are a mixture of rotational cutting to create a mosaic of different age classes of scrub on site. This benefits species such as *Lacerta vivipara* common lizard and *Natrix natrix* grass snake. On the Malvern Hills and Commons experimental scrub management is being targeted around *Vipera berus* adder hibernacula and feeding sites to provide habitat for prey species. Through the results of ongoing adder survey work the timing and intensity of grazing has been adjusted to ensure the scrub mosaic is maintained. Isolated patches of scrub are left in open habitats and these are used as breeding areas by grasshopper warblers. Some

areas of the Malvern Hills are also managed as coppice / scrub habitats to benefit *Muscardinus avellanarius* dormice.

4.3 Survey, research and monitoring

Most survey and monitoring programmes involving scrub are concerned with species utilising the habitat. In Worcestershire specific examples include:

- During December / January each year since 1969 research on the timing and location of brown hairstreak egg-laying has been undertaken by Butterfly Conservation volunteers using timed egg counts on the blackthorn hedgerows at Grafton Wood. A similar annual count is undertaken during April / May to record the movement of caterpillars.

- Trench Wood has been extensively studied for breeding birds. A BTO Common Bird Census was carried out in 1987, 1990 and 2003. In the first two surveys nightingales showed 11 and 14 pairs respectively but by 2003 there were none. One record has since been confirmed in Trench Wood in 2005, hopefully an indication of the success of the current management in re-instating suitable nightingale habitat within the wood.

- Bird ringing takes place at Roundhill Wood and this will contribute to our knowledge of scrub species using the site.

- In the past the reserve manager at Trench Wood has carried out monitoring of grass snakes and *Anguis fragilis* slow-worm on the site, the results showing that the presence and location of both species has direct links to the scrub management and its structural diversity.

The latest, most comprehensive review of the conservation value of scrub in Britain was carried out by Mortimer (2000).

The **British Trust for Ornithology** has a number of ongoing research programmes monitoring bird populations in the British countryside. Work is being carried out to document variation in scrub bird communities in relation to geographical location, botanical type and successional stage. The aim is to provide information about the conservation importance of scrub to birds and the effects of different scrub and woodland management procedures on birds. Within woodland, the aim is to study how birds distribute themselves, in relation to structure of the woodland (such as edges and rides) and tree species composition.

Milsom *et al* (2003) carried out a review of hill-edge habitats in the uplands of England and Wales for the Central Science Laboratory. The review looked at scrub habitats, and recognises the conservation importance of scrub and the benefits an increase in that habitat would bring. It was noted that there was a lack of scrub regeneration in many upland areas due to the grazing pressure.

Although scrub is not well researched or monitored it is an essential component of a well-managed site. Surveys of the scrub can give information on extent, plant species composition and structure as well as information on the distribution and status of scrub-using bird, animal and invertebrate species. Baseline

information should be gathered to inform any management decisions and ongoing monitoring is needed to continuously refine management techniques.

5. Associated Plans

Adder, Dormouse, Nightingale, High Brown Fritillary, Brown Hairstreak, Farmland Birds.

6. Vision Statement

Our knowledge and awareness of the conservation value of scrub habitats shall increase through surveys and monitoring throughout the county. The extent of scrub habitat will be accurately mapped. Where scrub exists, the management and restoration of this habitat will be a greater priority than the elimination and clearance of it. Environmental Stewardship advisors shall help find sites where scrub can be created and managed. Most of all, scrub will be managed to provide a range of priority species with their ideal habitat requirements.

7. Targets

Target Type	Target Text	Baseline Value	Target Value	Target Timescale
Expansion	Increase the number of HLS or ELS/HLS agreements that include options for maintenance, restoration or creation of scrub habitat.	3	10	2017
Restoration	Restore scrub habitat on the Malvern Hills.	54 ha	104 ha	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Supporting Organisations
WRC SCR CA 01	**2.1**	Create two opportunities to use the site as a demonstration project for blackthorn scrub management for brown hairstreak. Promote to local landowners through farm walk.	Grafton Wood and adjacent farmland	2017	BC	FWAG
WRC SCR CP 01	**3.16**	Produce and distribute information to commoners and graziers to raise awareness of the importance of scrub on MHC land and the aims of the scrub management trials.	Malvern Hills	2008	MHC	
WRC SCR CP 02	**3.5**	Create two local media opportunities to highlight the importance of scrub as a habitat to key species.	Worcestershire	2017	MHC	BC
WRC SCR HC 01	**7.2**	Scrub creation and restoration to provide suitable nightingale habitat.	Menagerie Wood, Lickmoor Coppice	2012	NT	
WRC SCR HC 02	**7.2**	Carry out habitat creation work to restore 50 ha of scrub.	Malvern Hills	2017	MHC	
WRC SCR RE 01	**10.15**	Continue scrub trials to determine optimum habitat mosaic for maintaining and increasing adder population.	Castlemorton Common	2017	MHC	

WRC SCR SP 01	**11.3**	Update SWS criteria to ensure that scrub and the scrub component of habitat mosaics is given better consideration in the selection of sites.	Worcestershire	2010	SWS Partnership	

BC – Butterfly Conservation **NT** – National Trust **MHC** – Malvern Hills Conservators **FWAG** – Farming and Wildlife Advisory Group

References and further information

Barkmann, J, J (1990). *A tentative typology of European Scrub and forest communities based on vegetation texture and structure.* Vegatatio, 86:131-141.

Milsom, T.P., Aegerter, J., Bishop, J.D., Allcock, J.A; Barker, D., Boatman, N.D., Hill, V., Jones, N., Marshall, J., McKay, H.V., Moore, N.P., & Robertson, P. A (2003). *Review of hill-edge habitats in the uplands of England and Wales.* Central Science Laboratory Report BD1235.

Mortimer, S.R., Turner, A.J., Brown, V.K., Fuller, R.J., Good, J.E.G., Bell, S.A. Stevens, P.A., Norris, D., Bayfield, N. and Ward, L.K (2000) *The nature conservation value of scrub in Britain.* JNCC report no.308.

The Forum for the Application of Conservation Techniques (FACT) (2003). *The Scrub Management Handbook*. FACT/English Nature.

Woodland Habitat Action Plan

1. Introduction

Of the UK land area a mere 1-2% is afforested with Ancient Semi Natural Woodland. There are priority UK BAPs for Lowland Beech and Yew Woodland, Wet Woodland (which has its own HAP within this Action Plan), Lowland Mixed Deciduous Woodland and Native Pine Woodlands.

2. Current Status

2.1 Description of habitat

The woodlands of Worcestershire reflect the relicts of the wildwood that developed over much of Britain after the last ice age. Much of the habitat was cleared during Neolithic times for settlement and agriculture and this has continued, at varying rates, to the present day. The fragments that have survived have been altered through man's activities such as clearance, conversion to commercial forestry plantation and removal or introduction of animal species that impact upon the habitat, such as native, non-native or naturalised species of deer, pheasant and grey squirrel.

Woodland can be described according to its origins: planted or natural, ancient or secondary; its silvicultural management e.g. coppice with standards, high forest or continuous cover forest; or its ecological type, determined by local conditions of soil, geology, hydrology and climate and to some degree by management if replanting has taken place. Management may also affect hydrology and soil-nutrient status, which will trigger community changes.

The woodlands of Worcestershire can be broadly grouped in terms of origin:
Ancient Woodland Sites (AWS) including:

- Ancient Semi-Natural Woodland (ASNW)
- Planted Ancient Woodland Sites (PAWS)

Recent or maturing secondary woodland including:

- Other Semi Natural Woodland (OSNW)
- Recent secondary woodland
- Broadleaved plantations
- Mixed deciduous / coniferous woodland
- Coniferous plantations

The ecological woodland types found in Worcestershire can be summarised as:

- Beech and yew woodland
- Ash with field maple woodland
- Oak woodland with bracken
- Oak woodland with birch
- Wet woodland (Itself comprising several community types. More detail can be found within the Worcestershire Wet Woodland HAP)
- Mixed woodland plantation
- Coniferous plantation

Quercus rober oak and *Fraxinus excelsior* ash are the two most typical types of woodland found in Worcestershire in ecological terms, with the composition of the

field layer the determining factor between individual community types. Although it is arguable whether *Fagus sylvatica* beech is native to the county, beech and *Taxus baccata* yew woodland is found as an individual example. Wet woodland comprising *Salix* sp. willow or *Alnus glutinosa* alder or a mixture of the two may be located in seasonally inundated areas or on soils that are permanently or regularly waterlogged. Both young and mature coniferous and mixed plantations feature throughout Worcestershire: in recent years only native woodlands have been created, falling into the OSNW category.

The species composition of any habitat is dictated by a combination of local conditions (soil and geology, hydrology and climate) and activities on or near the site. The often rich and diverse communities of ancient woodland have taken hundreds and sometimes thousands of years to develop. The species composition of new woodlands is determined in part by the habitat into which the woodland has developed or been planted and will slowly change as species that cannot tolerate the new conditions (such as reduced light levels) are lost and other species favoured by the new conditions become established. The timescale in which this occurs is dictated by species recruitment from the surrounding area (from hedgerows, old copses and other woodlands).

Woodland ecological types

The National Vegetation Classification for Woodland was developed by Rodwell in 1991 and is currently the accepted method of classifying woodland types. The species of the field layer and shrub-layer tell us most about the woodland community as the canopy layer may be much altered by management. Ancient woodlands will hold more species characteristic of a particular woodland type but recent woodlands can also be described by their NVC community. In Worcestershire the following lowland woodland vegetation types occur:

- **Calcareous to neutral soils: Ash-field maple woodland (NVC W8)**.
  NVC W8: *Fraxinus excelsior-Acer campestre-Mercurialis perennis.*
  This type of woodland is extremely variable in terms of species composition. Ancient semi-natural stands of ash-field maple woodland often support a rich diversity of flora and fauna.The canopy is usually characterised by ash, *Acer campestre* field maple, *Corylus avellana* hazel, pedunculate oak and *Ulmus glabra* wych elm. *Tilia cordata* small-leaved lime, *Sorbus torminalis* wild service, *Carpinus betulus* hornbeam and yew are other components that can be prominent in certain stands. This community is also the stronghold for *Tilia platyphyllos* large-leaved lime, which has a restricted distribution in Britain. The ground flora is often rich in herbs such as *Hyacinthoides non-scripta* bluebell, *Mercurialis perennis* dog's mercury, *Anemone nemorosa* wood anemone and *Viola* sp. violet.

  Historically, ash-field maple woodland was frequently managed as coppice although high forest stands became more common during the twentieth century. Replanting and the selection of particular species through management, for example hazel coppice with oak standards, has also been common practice within this woodland type in the past.

- **Neutral soils: Pedunculate oak woodland (NVC W10)**.
  NVC W10: *Quercus robur – Pteridium aquilinum – Rubus fruticosus.*

Both pedunculate and *Quercus petraea* sessile oak and their hybrids occur in this woodland type in Worcestershire. Pedunculate oak is dominant in the south and east with sessile oak becoming more common in the north and west of the county. Silver birch and *Betula pubescens* downy birch, small-leaved lime and the non-natives *Acer pseudoplatanus* sycamore and *Castanea sativa* sweet chestnut are also commonly associated species. This woodland type includes most of the county's small-leaved lime woods, such as the nationally important Shrawley Wood. The ground flora is generally not as rich as W8 woodlands, characterised by bluebell, *Pteridium aquilinum* bracken and *Rubus fruticosus* bramble.

- **Acid soils: Oak-birch woodland (NVC W16)**.
  NVC W 16: *Quercus spp- Betula spp-deschampsia flexuosa*
  This woodland is characterised by a canopy dominated by either downy or silver birch with pedunculate or sessile oak (mostly the latter in Worcestershire, where it occurs largely in the north of the county). Other canopy species are uncommon although *Ilex aquifolium* holly, *Sorbus aucuparia* rowan and hazel occur. The ground flora is typically species poor, dominated by grasses, bracken and other ferns, and mosses. *Calluna vulgaris* heather and *Vaccinium myrtillus* bilberry are often prominent. Oak and birch woodlands located around the Wyre Forest are similar to the oak-birch woodlands of the uplands (W11, W17), which are a Priority UK BAP habitat.

- **Wet soils: Alder-willow woodland (NVC W1, W6 and W7)**. A separate Habitat Action Plan within the Worcestershire BAP covers wet woodland.

The dominant woodland communities in Worcestershire show highest affinity with W8 and W10 woodland types.

Ancient semi-natural woodland and Planted Ancient Woodland Sites
These are woods that have been continuously wooded since at least 1600 and may be remnants of the ancient wildwood. Due to being long established they can hold a high diversity and abundance of woodland species. Management can affect this to varying degrees although much of the unseen diversity within an under-managed wood will remain in the seed bank and lie dormant until conditions become favourable for growth.

Planted Ancient Woodland Sites are those where the original native woodland has been felled to make way for new planting of non-native commercial species, frequently conifer but also other native or non-native broadleaved species. Examples of native species on AWS include the Wyre Forest where much of the native broadleaved forest was managed towards oak monoculture to support the tannin industry. Other PAWS have developed where non-native and often invasive shrub planting has occurred within woodland for the purpose of providing game cover and to a lesser extent as a fashion through the Victorian era and before. Some species used for this, such as *Prunus laurocerasus* cherry laurel, *Rhododendron ponticum* rhododendron and *Symphoricarpos albus* snowberry can quickly spread through a wood and adversely affect the native floral diversity of a woodland. See also FC Practice Guide: *Restoration of Native Woodland on Ancient Woodland Sites*.

Beech and Yew woodland
Lowland Beech and Yew woodland is a Priority UK BAP habitat. Beech is probably not native to Worcestershire although long established plantations of high biodiversity value are found in the south east of the county: Bredon Hill has a number of beech stands of considerable age that contribute to the importance of the site as a wood pasture habitat with a range of tree species.

Beech is often planted either amongst existing woodland, usually of the ash-field maple type, or as new plantations. The dense shade created by a beech canopy and the dense and decay-resistant leaf litter creates a characteristically bare ground flora although dog's mercury and bramble are often frequent. There are a number of variants of beech woodland in the country, but the most important type in Worcestershire is NVC W12 *Fagus sylvatica-Mercurialis perennis* woodland.

Worcestershire has a single example of yew wood (W13 *Taxus baccata* woodland).

Recent and maturing secondary woodland
Secondary woodland has largely evolved through changes in land use over the last 400 years where woodland has managed to establish on unused agricultural ground through natural succession. However, where land has been grazed or felled and wooded intermittently for many hundreds of years, secondary woodland will also be found. Some such habitats may offer interesting diversity in terms of ground flora due to what has survived in the soil seed bank. Since the development of grant schemes for woodland planting, secondary woodland has largely been created through grant-aided projects although some has been planted through landowners' desire alone. A proportion of projects have involved non-native plantation mixes but in more recent times only native broadleaved species planted in a way that mimics naturally regenerated woodland have been able to attract grant aid. New woods can also naturally regenerate, particularly in areas where grazing has been relaxed. Ash, sycamore and birch seed prolifically and readily invade open areas if the opportunity arises; for instance, secondary sycamore woodland is prominent in parts of the Malvern Hills.

Other Semi Natural Woodland (OSNW)
OSNW is naturally regenerated native woodland or that planted with native species using a planting matrix that mimics naturally regenerated woodland habitat. Most grant aided woodland creation projects of this nature will look to follow the Forestry Commission's Bulletin 112 '*Creating New Native Woodland*'.

Broadleaved plantations
Small plantations of broadleaved woodland are scattered throughout the county, planted over time for a variety of purposes. There are significant old plantations of sweet chestnut in the sandstone country around Kidderminster and in the west of the county small ash beds can frequently be found: a remnant of the hop growing industry from the 18th to the 20th century. In the post war period there was also a desire for planting *Populus* sp. poplar for the match industry on wet ground and, whilst this would not now be recommended because of the risk of destroying existing areas of valuable habitat, a plantation will occasionally develop an interesting flora as poplar casts only a very light shade. The last few decades have also seen a large number of small farm woodlands planted as part of various initiatives by forestry and conservation organisations.

Mixed woodland
Mixed woodland can include a very broad range of species such as pedunculate oak, ash, beech, poplar, *Pinus sylvestris* Scots pine, *Pinus nigra subsp. laricio* Corsican pine, *Picea abies* Norway spruce, *Larix* sp. larch and *Pseudotsuga menziesii* Douglas fir. Shrub layers and ground flora are often less rich in these woods largely due to their short history. Depending on the percentage of coniferous trees, heavy shade and acidic leaf litter (needles) can suppress ground flora.

Mixed woodland planting was also a key element of the design of estates and parklands, particularly during the 17th century, with many plantations created primarily for aesthetic purposes.

Coniferous plantations
All coniferous woodlands in the county are non-native, with the majority planted in the last 100 years. The principal coniferous species planted in Worcestershire are Scots pine, Corsican pine, Norway spruce, larch species, Douglas fir and occasionally *Picea sitchensis* Sitka spruce. Coniferous plantations typically have a species poor ground flora due to the dense shade produced by maturing trees although they can support scattered ferns, fungi, mosses and liverworts as well as providing valuable habitat for hawks.

2.2 Distribution and extent

Historical influences on woodland cover
The pattern of woodland today is very much a reflection of the evolution of the landscape, a process subject to physical, economic and cultural influences. Worcestershire is a county of contrasting landscape evolution: much of it retains a wooded character and strong associations with the ancient wooded land cover, most notably in the west, north and north east. Even where woodland has since been lost in such areas, the 'ghost' of the wildwood remains in hedgelines and woodland remnants, providing a vital reservoir of species for colonisation and expansion should new planting link together and expand these fragments. Worcestershire was once also the focus of a large concentration of royal hunting forests: by the 13th century, seven such forests were known in the county – Wyre, Feckenham, Ombersley, Horewell and Malvern, together with Kinver and Arden that extended from neighbouring counties.

In contrast, the south east of the county has long lost its ancient woodland and remains largely un-wooded today. The Vale of Evesham in particular, with its easily cultivated soils, was cleared of its ancient woodland cover at a very early stage in the deforestation of England and by Roman times was an important corn growing area: it has been an area notable for cultivation ever since. Elsewhere more recent designed woodland planting, associated with estates and parkland such as Croome, provides an additional range of woodland character.

Current distribution of woodland types
Worcestershire today contains around 12,800 ha of woodland, about 7.4% of the county area. This is slightly higher than some of the surrounding counties, for example Warwickshire has around 4.7%, and Shropshire 5.8%, but is below the national average of 8%. The composition of woodland is shown in table 1.

Table 1. Woodland coverage by type in Worcestershire.

Woodland type	Area covered (ha)	% of county
ASNW	4293	2.5
PAWS	1929	1.1
Other	6606	3.8
Total	12828	7.4

Of the woodland types described in section 2.1, ash-field maple woodland is the predominant woodland type on the more base-rich and calcareous soils in the county, occurring most commonly in the south and west.

Pedunculate oak woodland is the predominant semi-natural woodland on neutral and moderately acid brown earths. It occurs throughout the county and is the dominant type in the Severn Vale.

Oak-birch woodland is common on acidic and sandy soils and is particularly frequent in the north and west: in the Wyre Forest, the Teme valley and around Kidderminster.

There are considerable numbers of beech plantations on the edge of the Cotswolds in the south east of the county.

Worcestershire has a single example of yew woodland on the Abberley Hills.

The influence of topography – the Malvern Hills

Within the areas of 'ancient landscape' the composition of woodlands will vary reflecting the physiographical character of the locality. The topography of the Malvern Hills has played a part in the distribution of woods in the district with woodlands remaining in areas where the topography has impeded access by man and therefore management of the woodland for his purposes. The north and north west of the district is more undulating with brooks frequently flowing through steep, incised valleys. It is here that the dingle woods occur: these have been managed in a much more ad hoc and less intrusive way, with the steepest probably escaping management entirely (though these can still be invaded by non-native species such as sycamore and impacted upon by activities on adjacent land). The topography further south and towards Worcester is generally flatter and brooks do not, as a rule, flow through steep incised valleys. Here there are fewer woodlands, although a couple of large woods still remain such as Shrawley Wood and Monkwood.

On a broad-scale, a major effect of a history of intensive management is on the structural diversity of the canopy. In the dingle woods, structural diversity is created by trees regularly toppling over on the steep slopes and also by the greater age range and species diversity. Woods on less steep ground (and the plateaux between dingle valleys) have in the main been intensively managed forming even-aged stands, and sometimes mono-species stands. The result is an even canopy with little structural diversity and little light reaching the field-layer. This prevents the growth of some species but also prevents flowering of others, such as meadowsweet, bramble and shrubs such as hawthorn, so reducing the availability of nectar and fruit that are vital food resources for invertebrates, birds and small mammals. This is exacerbated where these stands are of species forming particularly dense canopies or particularly decomposition-resistant leaves – sycamore, sweet chestnut, beech and any conifer. The majority of the diversity of woodland ground flora species in these woods is restricted to tracks and the woodland edge.

2.3 Legislation and policy

During the 1992 UN Earth Summit in Rio the UK Government signed up to a suite of key environmental caveats including the Biodiversity Convention and a Statement of Forest Principles. At the Helsinki Ministerial Conference in 1993 European Governments built on these principles by adopting a set of sustainable forest management guidelines with a specific focus on the conservation of European biodiversity. The UK Government responded by publishing 4 interrelated documents including *Sustainable Forestry – the UK Programme* and *Biodiversity – the UK Action Plan.* As part of a reaction to this the UK Forestry Standard was conceived in 1998 (then updated in April 2004), which was deemed the Government's approach to sustainable forestry and woodland management.

The Forestry Act 1967 regulates the felling of all trees over licensable size and volume and it is an offence under the Act to fell trees over and above that threshold without a licence from the Forestry Commission. There are limited exceptions to this including felling trees in gardens and churchyards and where the duties of statutory undertaking must be carried out such as those activities conducted by the railway authorities or the electricity board.

Further protection is afforded to woodlands under the Wildlife and Countryside Act 1981 and the Countryside and Rights of Way Act 2000, which allow for SSSI designation and enforcement. Protection is afforded to non-designated trees or woodlands under the *Town and County Planning Act 1991* where works to trees in a Conservation Area or those subject to a Tree Preservation Order (TPO) requires written consent from the Local Planning Authority. Other woodlands are identified and listed as important county sites through the Special Wildlife Site process.

A limited degree of protection is offered to many ancient woodland sites through their identification and protection by policies in county and district Local Plans.

A voluntary standard has been adopted after the introduction of the Forest Stewardship Council-approved UK Woodland Assurance Scheme (UKWAS). This involves woodland owners and managers adopting set principles and criteria conforming to the sustainable management of UK woodlands under an FSC approved certification standard.

Several woodland species are protected under the Wildlife and Countryside Act 1981. Amongst others the *Muscardinus avellanarius* dormouse, *Boloria euphrosyne* pearl-bordered fritillary and all 17 species of bat found in the UK are covered by schedule 5 of the Act as well as EC Habitats Directive Annex II and/or IV. *Luscinia megarhynchos* nightingale and others are listed on Annex II of the Berne Convention.

Woodland managers will need to consider the presence of protected species and follow good practice guidance to avoid committing an offence. In some cases management practices may need to be modified or rescheduled to a less sensitive time of year, and where this is not possible or adequate then operators may need to apply for a licence to remain within the law. Most activities will be able to continue without the need for a licence through the following of good practice guidance.

The Forestry Commission will be able to provide support in relation to guidance needed where protected species are present, and will process any applications for licences to carry out work where they are needed. The licences will be issued by Natural England's National Licensing Unit.

The UK Forestry Standard includes Standard Note 5 '*Managing Semi Natural Woodland'* which forms the basis and main principles for managing ASNW and PAWS sites as set out in FC Practice Guides 1-8: *The Management of Semi Natural Woodlands*. This has been further consolidated by the launch of England's Ancient Woodland Policy in 2005 ***'Keepers in Time'*** as well as England's latest woodland and forest strategy in 2007*,* ***'England's Trees, Woods and Forests****'.*

2.4 Summary of important sites

The Wyre Forest, which extends into Shropshire, is the third largest area of ASNW in England. The plateau soils are generally acidic but the valleys and slope bottoms are more base-rich. Sessile and pedunculate oak are common with ash, *Ulmus procera* English elm, small-leaved lime, the nationally rare *Sorbus domestica* true service tree and *Alnus glutinosa* common alder in the valleys. Large-leaved lime, *Cephalanthera longifolia* narrow-leaved helleborine, *Carex montana* soft-leaved sedge and *Aquilegia vulgaris* columbine are amongst the scarcer species found. The Wyre Forest is, perhaps, the most important area for woodland biodiversity in the county because of its extent and because of the geographical and plant community links of its upper slopes with the oak coppices of Wales, its valleys with the woodlands of the south Welsh borderlands, and local patches of ash/hazel woodland reminiscent of East Anglian woods.

Important areas of PAWS and ASNW are found on the West Malvern to Abberley Hills ridge north from the Malvern Hills and across to the Teme Valley woodlands. The Malvern Hills woodlands are remnants of Malvern Chase, a Royal Forest that was disafforested by Charles I in 1644. The woods of the Teme Valley form an interesting series of limestone woodlands with a species-rich shrub and ground flora layer. Small-leaved lime and wild service tree are frequently present, as well as a wide variety of ancient woodland indicator species such as *Lathraea squamaria* toothwort, *Platanthera chlorantha* greater butterfly-orchid, *Iris foetidissima* stinking iris and *Campanula trachelium* nettle-leaved bellflower. These woodlands are very similar to, if not identical with, the *Tilio-Acerion* ravine forest community listed under the EU Habitats and Species Directive (1992) as a priority habitat for protection. Consideration needs to be given to this.

A notable group of PAWS are the woods collectively known as the 'Harris Brush Company Woods'. These are all sited on large ancient woodland sites in the centre and south of the county within easy reach of the company's factory at Stoke Prior. Whilst owned and managed by Harris these woodlands were often planted with exotic species for specific wood products, such as grey alder or sycamore to produce white wood poles for turnery or sweet chestnut for fencing. Plantations on new sites can be difficult to classify using NVC but the Harris Woods and others on ancient woodland sites can be classified using surviving ancient woodland species. The shrub layer and ground flora of plantation woodlands is often less diverse than ancient sites growing on similar soil types. However, these woodlands are often important for particular species of birds, plants and invertebrates with high individual nature conservation value. Such

woodlands, including Trench Wood and Monkwood, raise the national conservation value of plantation woodlands. Most of the woodlands in the central Worcestershire plain are typically pedunculate oak over hazel coppice. Many support rich ground floras such as *Paris quadrifolia* herb-paris, *Orchis mascula* early-purple orchid and greater butterfly-orchid. Trench Wood was once famed for its nightingales but, along with other woodlands in Worcestershire, they have all but disappeared in recent years. Roundhill and Grafton Woods and their surrounds support the only *Thecla betulae* brown hairstreak butterfly population in the West Midlands.

Shrawley Wood SSSI was selected as it consists of a large tract of ancient woodland dominated by coppiced small-leaved lime, a habitat unusual in the West Midlands. Other standard trees include occasional pedunculate oak, downy birch, rowan and ash with alder in the wetter areas. On the slightly acidic soils of the plateau the ground flora is dominated by bracken, *Digitalis purpurea* foxglove and bluebell. On the more alkaline slopes dog's mercury, *Circaea lutetiana* enchanter's-nightshade and *Allium ursinum* ramsons become more abundant. Many interesting and locally uncommon plants occur within the ground flora, including herb-paris, *Campanula latifolia* giant bellflower, *Epipactis helleborine* broad-leaved helleborine and *Convallaria majalis* lily-of-the-valley. Two rarities, *Festuca altissima* wood fescue and *Campanula patula* spreading bellflower are also present. *Chrysosplenium oppositifolium* opposite-leaved golden-saxifrage and *Cardamine amara* large bitter-cress are present in the waterside communities and wet flushes and the rare *Ceratophyllum submersum* soft hornwort occurs in one of the pools. The latter is nationally uncommon and restricted in distribution in the UK. Over 400 species of fungi have been recorded and the wood is also important for its breeding birds. The woodland is part managed by Forestry Commission England.

Chaddesley Wood NNR is managed by Worcestershire Wildlife Trust on behalf of Natural England. This 59 ha site (believed to be a remnant of the former Royal Forest of Feckenham) is predominantly oak woodland with occasional hazel, holly, ash and rowan with areas of plantation, scrub and grassland. Uncommon plants include bluebell, early-purple orchid and herb-paris. *Loxia curvirostra* crossbills breed in the conifers of the plantations. The grassland is a wet meadow with a rich flora and invertebrate fauna.

Tiddesley Wood has been wooded since before the preparation of the Domesday Book in 1086. Most of the site is broadleaved woodland dominated by ash and pedunculate oak, with field maple and coppiced hazel in the shrub layer. In some areas the canopy also contains small-leaved lime and silver birch, and in places there are stands of invasive suckering English elm. Wild service tree, *Euonymus europaeus* spindle and *Viburnum lantana* wayfaring tree are also present. In the past there have been unsuccessful attempts to replant parts of the wood with conifers and in most places native broadleaved trees and shrubs have re-established. The ground flora is rich and dominated by bramble, dog's mercury or bluebell. Wood anemone and *Primula vulgaris* primrose are abundant in places, and a number of locally uncommon species occur, such as *Colchicum autumnale* meadow saffron, *Neottia nidus-avis* bird's-nest orchid, herb-paris, broad-leaved helleborine and *Epipactis purpurata* violet helleborine. The site is also notable for its butterflies and dragonflies and *Gnorimus nobilis* noble chafer beetle is found in the orchard adjacent to the wood.

3. Current factors affecting the habitat

- Deer have increased significantly in the English countryside and populations of *Dama dama* fallow deer, *Capreolus capreolus* roe deer and *Muntiacus reevesi* muntjac all affect the woodlands of Worcestershire to varying degrees. Deer presence results in bark stripping, prevention of woodland regeneration, damage to ground zone plants and damage to young tree stock.
- Damage caused by *Sciurus carolinensis* grey squirrel via bark stripping results in significantly reduced longevity of native trees. Bark stripping also reduces sustainable timber management options and may jeopardise the viability of new native woodlands and PAWS restoration projects.
- Invasion of semi-natural woodlands by non-native plant species such as rhododendron, *Fallopia japonica* Japanese knotweed, sycamore, *Quercus cerris* Turkey oak, *Impatiens glandulifera* Himalayan balsam, snowberry and cherry laurel.
- Scrub clearance may reduce the potential for woodland in some areas. In others, the speed of reversion following abandonment of management reduces tree growth.
- Influence of surrounding land-use and the management of boundary features and woodland edges.
- Air pollution and other environmental influences originating from distant sources.
- Fly-tipping of organic matter can influence the field layer.
- Economic considerations will often influence the desire to perform essential management. PAWS restoration may not be a priority despite grant incentives due to commercial returns, viability of forest operations, trade deficit in forest products, the influence of the strength of sterling on European and world markets, imported forest produce (timber, particle board, pulp, paper etc) and market stability.
- The growth of the woodfuel market should, over the next few years, have a positive impact on the management of both existing AWS and woodlands that are currently unmanaged or under-managed.
- The use of heavy machinery in some forestry operations can cause damage through soil compaction etc and this must be addressed if currently neglected or under-managed woodlands are to be brought back into management.
- Skewed age class distribution and structural diversity of trees in managed and production woodlands. The biodiversity value of a single-age, monoculture woodland is greatly reduced.
- Excessive recreational use of woodlands, for example paint-ball, all-terrain vehicles or excessive visitor disturbance including dog walking.
- Use of woodlands for intensive game rearing, hunting and shooting has been a reason to retain woodland. However, some operations for game management may conflict with biodiversity.
- Fragmentation of woodland due to development or clearance for other land uses.
- Baseline data kept in relation to woodland activities and species composition are dispersed and can be difficult to access. There is often a deficiency in the species-specific information and plant community

structure data for woodlands that may hinder conservation management and sustainability monitoring.

4. Current Action

4.1 Local protection

Much of the Wyre Forest is designated a Site of Special Scientific Interest and part as a National Nature Reserve. The main landowners / managers are Forestry Commission England (FCE) and Natural England (NE), who together manage around 45% of the forest, with the remaining land being owned privately.

Chaddesley Wood is a National Nature Reserve and part of the site is included within the Feckenham Forest SSSI designation along with Randan and Pepper Woods. Other woodland SSSIs include Aileshurst Coppice, Areley Wood, Crew's Hill Wood, Grafton Wood, Monkwood, Rabbit Wood, Tiddesley Wood and Trench Wood. Other notable SSSIs are Pipershill Common, an area of remnant wood pasture, and Shrawley Wood, a locally rare example of small-leaved lime coppice woodland.

Worcestershire Wildlife Trust has identified many other ancient woodland sites as Special Wildlife Sites.

4.2 Habitat management and programmes of action

Government has given the Wyre Forest high priority for PAWS restoration, including Ribbesford Woods to the south of the Wyre Forest. This aims to restore sites to native woodland and ensure the retention of remnant ancient semi-natural woodland features that survive. FCE is responsible for implementing the restoration works.

A partnership of organisations, led by FCE, has recently been successful in securing a development grant from the Heritage Lottery Fund, plus additional funding from other sources, for the Grow with Wyre project. This will implement a series of 22 projects within the forest covering habitat management and restoration work, education, awareness and training, rural economy and public access. Within the first of these categories six projects are being developed including the SITA Trust-funded 'Back to Orange' initiative, which will implement habitat management and monitoring work for several butterfly and moth species, a sustainable deer management programme and other projects focused on traditional orchards, hedgerows and ancient trees.

Worcestershire Wildlife Trust own or manage a number of ASNW sites within the county including several of the Harris Brush woodlands such as Hornhill, Trench and Monkwood. The latter two, along with Grafton Wood, are owned and managed in partnership with Butterfly Conservation. The Trust also manages Chaddesley Wood and Tiddesley Wood, the largest continuous areas of woodland in the county outside of the Wyre Forest.

The Malvern Hills Coppice Network is a group of coppice craftsmen, woodland owners, managers, conservationists and green woodworkers, all committed to the restoration of coppice woodlands in the Malvern Hills area. Members offer a wide range of coppice products and services, woodland craft courses and volunteering opportunities.

The Forestry Commission operate the English Woodland Grant Scheme to provide assistance for woodland owners in the regeneration, improvement and management of existing woodland and the creation of new woodland. Strong influences during the application assessment process include ensuring proposals are fully sustainable, that implementation of local and national policy is exercised and the delivery of Habitat and Species Action Plan targets occurs where possible.

Under the Entry Level Environmental Stewardship scheme there are options for the management of woodland edges and for the maintenance of woodland fences to prevent grazing and trampling damage. Under the Higher Level Scheme there are options for the maintenance, restoration and creation of wood pasture and parkland, woodland and successional areas and scrub.

Butterfly Conservation began a re-introduction programme for pearl-bordered fritillary in 2006 in the Forest of Feckenham area of Worcestershire following habitat assessment surveys of a number of woodlands where coppicing has been reintroduced (Barker, 2002). Captive stock was set up from wild Wyre Forest stock (Joy, 2006) and released initially into Grafton Wood.

4.3 Survey, research and monitoring

Worcestershire Wildlife Trust is currently re-surveying woodland Special Wildlife Sites as part of an ongoing review of all county SWS.

Dormice

Since 2000 the Forestry Commission Research department has been heavily involved in an in-depth dormouse study in Ribbesford Woods, including radio tracking and micro-chipping. The initial aim of the project was to "devise various methods of thinning conifers that sustain the local dormouse population in the short and medium term". This has now altered quite dramatically due to the government's decision on PAWS reversion and the projects main aim is now to find the "best method of reverting coniferous plantations back to native broadleaves, while maintaining dormice populations".

There are a total of 550 dormouse boxes throughout the woodland, 225 of those within a designated 17 ha research area in which all animals found weighing above 12g were micro-chipped in 2002/03 to follow their movements prior to, during and after thinning operations. The research will continue to monitor the population dynamics of the resident dormouse population during PAWS restoration and survey data will be passed to the National Dormouse Monitoring Programme. Current best practise in relation to PAWS restoration is incorporated within Natural England's Dormouse Conservation Handbook.

Lepidoptera

As part of the 'Back to Orange' SITA Trust project survey, monitoring and research work will be focused on several butterfly and moth species in the Wyre Forest for the next three years, including the LBAP species *Minoa murinata* drab looper, *Pechipogo strigilata* common fan-foot and pearl-bordered fritillary.

Annual transects are carried out within several Worcestershire Wildlife Trust / Butterfly Conservation woodlands to monitor the butterfly populations. There is

also an annual programme of egg counts to monitor the population of brown hairstreak within and around Grafton Wood.

Several PhD projects are currently ongoing within Chaddesley Wood researching the behaviour and populations of various bird species.

5. Associated Plans

Wet Woodland, Dormouse, Brown Hairstreak, Grizzled Skipper, Pearl-bordered Fritillary, Drab Looper, Common Fan-foot, Wood White, Nightingale, True Service Tree.

6. Vision Statement

To protect, maintain and enhance the native semi-natural woodland habitat of Worcestershire, reflecting the characteristic variations in composition and pattern across the county.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Maintain extent	Maintain existing Ancient Semi-Natural Woodland resource	4293 ha	4293 ha	2017
Restore	Restore 1000ha of habitat	0 ha	1000 ha	2017
Expand	Create 430ha of native broadleaved woodland through targeted planting or allowing natural regeneration in suitable areas identified through relevant biodiversity and landscape character strategies	4293 ha	4723 ha	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Supporting Organisations
WRC WOD AP 01	**1.1**	Ensure two-way flow of information / communication between West Midlands Forestry Forum and all relevant parties is initiated on at least a bi-annual basis.	Worcestershire	2017	FCE	
WRC WOD CA 01	**2.11**	Identify and/or prepare guidance on woodland character in the county and appropriate management and planting to achieve biodiversity gain and promote to relevant parties as appropriate.	Worcestershire	2008	FCE	NE WWT WCC
WRC WOD CA 02	**2.1**	Identify strategic sites that can be used to promote good practice in woodland management with regard to biodiversity gain.	Worcestershire	2010	FCE	WWT
WRC WOD CP 01	**3.16**	Within strategic areas identified through WRC WOD HS 01, develop an information campaign to educate landowners of the significance of ASNW as a biodiversity resource to encourage their support for woodland creation and enhancement.	Worcestershire	2017	FCE	WWT NFU FWAG NE

WRC WOD CP 02	**3.16**	Devise and implement an education programme for woodland advisors, contractors, owners and tree wardens on the conservation management of semi-natural woodland and best practice in restoring planted ancient woodland sites.	Worcestershire	2010	FCE	FWAG WWT NE
WRC WOD CP 03	**3.17**	Promote and support the Forest School initiative and increase the number of active Forest Schools to 330.	Worcestershire	2017	WCC	FCE
WRC WOD FR 01	**4.13**	Maintain and support existing tree warden network and aim to recruit sufficient new tree wardens to increase the number of parishes with an active warden to 130.	Worcestershire	2017	WCC	
WRC WOD HC 01	**7.4**	Using Habitat Inventory, Woodland Opportunities Map and Landscapes for Living initiative, devise a targeted plan for enhancing the current woodland resource and linking woodland fragments to maximise biodiversity value.	Worcestershire	2009	FCE	NE, WWT, WCC WDC, BDC, MHDC, WFDC RBC, WorcsCC
WRC WOD HS 01	**6.1**	Carry out Phase Two of forestry operations in Ribbesford Wood.	Ribbesford Wood	2009	FCE	
WRC WOD SM 01	**12.1**	Implement and complete management works within the Native Woodland Plan for Lickmoor Coppice, which includes coppicing, ride management & PAWS restoration.	Lickmoor Coppice	2015	NT	
WRC WOD SP 01	**11.3**	Review and re-notify woodland SWS and pass information to Local Planning Authorities, FCE, WBRC and owners.	Worcestershire	2009	WWT	WCC, BDC, RDC, WorcsCC, MHDC, WFDC, WDC, FCE

FCE – Forestry Commission England **WWT** – Worcestershire Wildlife Trust **WCC** – Worcestershire County Council
NT – National Trust

References and further information

Barker, S (2002). *The feasibility of re-establishing the Pearl-bordered Fritillary Boloria euphrosyne in Feckenham Forest, east Worcestershire*. Unpublished report for Butterfly Conservation.

Department for Environment, Food and Rural Affairs (2007). *A Strategy for England's Trees, Woods and Forests*. Defra.

Joy, J. 2006. Pearl-bordered Fritillary (*Boloria euphrosyne*) Wyre Forest 2006 Monitoring Report. Report for Natural England and the Forestry Commission. Butterfly Conservation Report No: SO6-17.

Thompson, R., Humphrey, J., Harmer, R and Ferris, R (2003). *Restoration of native woodland on ancient woodland sites*. Forestry Commission Practice Guide.

Wet Woodland Habitat Action Plan

1. Introduction

Wet Woodland is a priority UK BAP habitat.

2. Current Status

2.1 Description of habitat

Wet woodland occurs on poorly drained or seasonally wet soils, usually with *Alnus glutinosa* alder, *Betula* sp. birch and *Salix* sp. willow as the predominant tree species, but sometimes including *Fraxinus excelsior* ash, *Quercus rober* oak and *Fagus sylvatica* beech on drier riparian areas. It is found on floodplains as successional habitat on fens and bogs and around water bodies, along streams and hillside flushes and in localised peaty hollows. The soils on which these woods occur range from nutrient-rich mineral to very acid, nutrient-poor organic soils. Boundaries with dry-land woodland may be sharp or gradual and can change over time through natural succession or as a result of human influence.

The NVC system classifies eight woodland types as being dominated by the presence of alder, birch and willow in situations where the wetness of the ground is the overriding influence on species composition. Types occurring in Worcestershire are:

- W1 *Salix cinerea-Galium palustre* woodland is occasional in Worcestershire and is a community of wet mineral soils on the margins of standing or slow-moving waters and moist hollows. This can grade into the W6 woodland communities in shallower water and waterlogged soil.

- W5 *Alnus glutinosa-Carex paniculata* woodland is extremely scare and localised in the county. It occurs on areas of fen peat and mire where there is a strong influence from base-rich ground waters.

- W6 *Alnus glutinosa-Urtica dioica* woodland is found on wet, nutrient-rich soils e.g., shallow banks along brook meanders that receive a lot of sediment-rich winter flood water.

- W7 *Alnus glutinosa-Fraxinus excelsior* woodland occurs on mineral-rich flushes, not necessarily associated with brooks or pools, but where there is not a high build-up of nutrients. The dominant species of the groundflora vary according to the soils and geology; *Carex pendula* pendulous sedge may dominate or it may be more diverse with *Chrysosplenium oppositifolium* opposite-leaved golden-saxifrage prominent.

Wet woodlands frequently occur in a mosaic with other woodland and open ground habitats and management of individual sites needs both woodland and wetland requirements. Many alder woodlands are ancient and have a long history of coppice management that has determined their structure. Other wet woodlands have developed through natural succession on open wetlands and have little forestry influence. Some are the result of the planting of osiers for

basketwork and through long abandonment these have developed into semi-natural stands. For example, in the Severn and Avon Vales recent wet woodland occurs in old clay pits in the Severn Valley often in juxtaposition with marshes as at Norton and Grimley Brickpits, and as a few small woodlands developed from former osier beds such as Ripple Lake and the Napps.

Wet woodland combines elements of many other ecosystems and as such is important for many taxa, including providing important cover and breeding sites for *Lutra lutra* otter. The high humidity in these habitats favours mosses, lichens, liverworts and dead wood fungi. The number of invertebrates associated with alder, birch and willow is very large, including specialised beetles, craneflies, other flies and molluscs. Dead wood and saturated ground are micro-habitats commonly associated with wet woodland. While few rare plant species depend on wet woodland, there may be relict species from the former open wetlands such as *Thelypteris palustris* marsh fern.

2.2 Distribution and extent

There is estimated to be around 75,000 ha of ancient semi-natural wet woodland in Britain, dominated by alder, willow and birch. In Worcestershire, ancient wet woodland is scarce and often undefined. Wet woodland dominated by alder and willow has an estimated extent of 224 hectares, 2% of all woodland in the county (Worcestershire Red Data Book 1998). It mostly occurs as riparian woodland or associated with springs or flushes and old mineral workings. The greatest proportion occurs in the Midland Plateau (38%) and the Severn and Avon Vales (56%). In the former, the River Stour and its tributaries such as the Blakedown Brook contain important linear woods of alder and *Salix fragilis* crack-willow that have developed on alluvium or peat and are fed by springs from the Triassic sandstone. These include the largest single alder wood in the county at Hurcott and Podmore Pools SSSI. In the south of the county a number of small (<3 ha), old wet woodlands occur with the name Arles – a local name for alder.

The topography of the Malvern Hills area has played a part in the distribution of woods within the District with woodlands remaining in areas where the topography impedes access. The north and north-west of the district is more undulating with brooks frequently flowing through steep incised valleys – it is here where the majority of dingle woods in the county occur, either alone or in association with wooded plateaux between and around the dingles; these include many of the best examples of woodland SWS in the district. The geology and variation in topography provides variation in soils and water regimes enabling different types of woodland to flourish including wet woodland communities.

2.3 Legislation

National forestry policy includes a presumption against clearance of broad leaved woodland for conversion to other land uses, and in particular seeks to maintain the special interest of Ancient Semi-Natural Woodland.

Felling licences from the FC are required for licensable timber in woods but ‘scrub woodland’ may be vulnerable to clearance outside the felling regulations. Some 115 current Woodland Grant Schemes include ASNW. Most will include at least a small element of wet woodland habitat.

Relevant hydrological policy issues include water level management plans. Potential means of controlling damaging activities include impoundment licenses and consents for abstraction and land drainage issued by the Environment Agency.

2.4 Summary of important sites

The Severn and Avon Vales Natural Area has locally significant pockets of wet woodland that have developed as secondary woodland on mainly wet soils in the river valleys and in the clay pits and marshes along the Severn and Avon rivers. Alder and willow carr have also developed from former osier beds or on disused brick pits. Many old osier beds are unmanaged and as they mature an abundance of deadwood and decaying stumps can provide good invertebrate and bird habitat.

There is also a rich riparian habitat associated with the River Stour corridor and the lower plants and fungi of the wet woodlands in this area form significant assemblages.

Hurcott and Podmore Pools SSSI is the largest wet woodland site in the county, comprising a large area of alder carr situated in the valley of the Blakedown Brook near Kidderminster. The site consists of two pools with adjoining woodland and was selected for notification as an important wetland complex. Both pools were constructed in medieval times to provide power for mills. They have rich riparian vegetation zones at their upstream ends consisting of extensive beds of *Typha angustifolia* and *T. latifolia* bulrush with *Sparganium erectum* branched bur-reed, *Alisma plantago-aquatica* water-plantain and *Carex riparia* and *C. acutiformis* greater and lesser pond-sedge. Extensive patches of *Nuphar lutea* yellow water-lily occur in Hurcott Pool.

The ground flora includes characteristic wetland species such as *Caltha palustris* marsh-marigold, *Cirsium palustre* marsh thistle, *Galium palustre* marsh bedstraw and a number of sedge species including *Carex pseudocyperus* cyperus sedge. Plants uncommon in this part of the West Midlands also occur including *Carex paniculate* greater tussock-sedge, *Chrysosplenium alternifolium* alternate-leaved golden-saxifrage, *Cardamine amara* large bitter-cress and the nationally rare *Impatiens noli-tangere* touch-me-not balsam is found here at its only county location. The open water and woodland form an important habitat for bird life. More than 30 species of bird breed here including *Podiceps cristatus* great crested grebe, *Tachybaptus ruficollis* little grebe, *Alcedo atthis* kingfisher and *Acrocephalus scirpaceus* reed warbler.

3. Current factors affecting the habitat

Wet woodland in Worcestershire is or has been affected, to varying degrees, by the following factors that directly or indirectly impact upon its current condition and dynamics:

- Historical clearance and conversion to other land uses, and some present-day clearance of recently established stands that fall outside of felling regulations.

- Habitat fragmentation resulting in small sites that are then vulnerable to the adverse effects of adjacent intensive land use and to loss of species dependent upon larger habitat units.

- Artificially restrictive boundaries to wet woodland sites due to adjacent intensive land use, leading to limited structural diversity and lack of biologically-rich woodland edge habitat.

- Lowering of water tables through drainage or water abstraction resulting in a change to drier woodland types.

- Cessation of management in formerly coppiced sites, resulting in the loss of former structure and increased shading of the herbaceous layer.

- Past and ongoing flood prevention measures, river control and canalisation leading to a loss of dynamic disturbance-succession systems and invertebrate communities as well as reductions in the extent of sites.

- Damaging grazing by livestock and deer, leading to a simplification of woodland structure, ground flora impoverishment and lack of regeneration.

- Poor water quality arising from eutrophication, urban effluents or rubbish dumping leading to negative changes in the composition of the ground flora and invertebrate communities.

- Many blocks of woodland will have a fringe of poor vegetation where the edges of the site are damaged by spray drift and agricultural run-off. The nature of wet woodland means that the habitat often occurs in narrow linear strips and therefore the entire site is vulnerable to damage of this nature.

- Invasion by non-native species that can then dominate the vegetation composition and lower the nature conservation value of the site. In particular *Impatiens glanulifera* Himalayan balsam is causing devastating losses of habitat on many wetland sites, and in some instances this has led to complete abandonment of conservation management.

- Air pollution may negatively impact on the bryophyte and lichen communities.

- Diseases such as *Phytophthora* root disease of alder.

- Climate change speeding succession to drier woodland types.

4. Current Action

4.1 Local protection

Statutory site protection plays a small part locally in the conservation of this habitat type. A number of SSSIs notified for wetland and other interests incorporate wet woodland features. These include Hurcott and Podmore Pools and Wilden Marshes.

Some important sites incorporating wet woodland habitat are identified as County Special Wildlife Sites. Some of these are under protective ownership by conservation bodies such as Worcestershire Wildlife Trust, including Ipsley Alders, Upton Warren and Spennells Valley.

Some sites are included in District Local Plans as 'third tier' sites of local importance, and thus are afforded protection at a local level.

Some individual trees and woodland areas may be subject to Tree Preservation Orders.

4.2 Habitat management and programmes of action

All woodland should be managed according to the UK Forestry Standard (1997). Information on ownership categories is not readily available but the majority of wet woodlands in Worcestershire are in private ownership and their management aspirations are poorly known. Many wet woodlands are unmanaged and would benefit from a planned approach. The Forestry Commission Guide to the Management of Wet Woodlands (1994) is the model that should be adopted, together with relevant aspects from the Forestry Commission Forestry and Water and Conservation Guidelines. Guidance on creating new wet woodlands is available in Forestry Commission (FC) and Natural England (NE) bulletins and reports.

Grants for, and advice on, management are available from the FC generally, from NE in relation to SSSIs and from Worcestershire Wildlife Trust, Worcestershire County Council and the Environment Agency in relation to wet woodland elements of waterside landscapes. Worcestershire Wildlife Trust is also able to help with more specific advice and surveys of wet woodland Special Wildlife Sites. FWAG are able to provide management advice for privately owned on-farm wet woodland habitats.

The experience of woodland managers is also developed and promoted through the Small Woods Association, Timber Growers Association, Royal Forestry Society and others.

4.3 Survey, research and monitoring

Surveys of the Worcestershire wet woodland resource have been undertaken by Natural England for individual SSSIs.

Worcestershire Wildlife Trust has survey data for some wet woodlands, the majority those with SWS status. WWT is currently undertaking a review of all woodland SWS and this will give additional information on wet woodland where it occurs on those sites.

Forest Research, the research agency of the FC, has a Riparian Woodland and Water Protection project with five main topics of study:

- The effect of riparian woodland management on the freshwater environment.
- The impact of conifer clearance from the banks of upland streams.
- The role of riparian shade in controlling stream water temperature in a changing climate.
- Guidance on the management of riparian buffer areas within commercial forests.
- Indicators of ecological quality in rivers: RIVFUNCTION (EU sponsored research).

Publications available include the Forest and Water Guidelines and The Management of Semi-Natural Woodlands: Wet Woodlands. Both are available from www.forestresearch.gov.uk.

4.4 Action for priority species

Further research is needed into the requirements of specialist invertebrates within wet woodlands and actions related to these included in site management plans. Bats need to feature within all site management plans in order to protect existing populations from the effects of woodland management and to insure that wherever possible opportunities are taken to provide habitat for bats within the wet woodland environment.

5. Associated Plans

Scrub, Woodland, Reedbeds, Fen and Marsh, Ponds and Lakes, Rivers and Streams, Wet Grassland, Veteran Trees, Bats, White-clawed Crayfish, Black Poplar.

6. Vision Statement

To insure all of Worcestershire's wet woodland sites are in optimum hydrological condition and free from nutrient pollution with an ecology seen to be moving towards or in favourable condition. In addition, these woodlands are recognised by the local population as being a vibrant wildlife resource that is a valued part of that community.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Maintain extent	Maintain 224ha of existing habitat	224ha	224ha	2017
Achieve Condition	50% of the current wet woodland resource to achieve a more favourable ecological condition	0 ha	112 ha	2017
Restore	Restore 5 ha of wet woodland	224ha	229ha	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Supporting Organisations
WRC WWO AP 01	**1.1**	Arrange an annual meeting with wet woodland site owners/managers to provide advice on management techniques and best practice.	Wyre Forest District	2017	WFDC	FCE WWT
WRC WWO CA 01	**2.12**	Identify SWS with a wet woodland element where targeted management advice and support could achieve key biodiversity outcomes. Provide advice and current best practise on appropriate management and restoration practices.	Forest of Feckenham Severn and Avon Vales	2017	WWT	FCE
WRC WWO CP 01	**3.9**	Organise an annual public forum to encourage the involvement of the local community in the management of Hurcott wet woodland.	Hurcott Pool	2017	WFDC	
WRC WWO CP 02	**3.7**	Produce a leaflet or interpretation panel demonstrating the reasons and need for management of wet woodland using Hurcott as an example.	Worcestershire	2008	WFDC	EA

WRC WWO CP 03	**3.15**	Hold an annual event for either the public or conservation staff promoting Hurcott Pool restoration project and the value of wet woodland and the wildlife it supports.	Hurcott Pool	2017	WFDC	
WRC WWO FI 01	**5.3**	Envestigate and establish one business partnership that enables the marketing of wet woodland products and promotion of the profitability of managing the habitat.	Wyre Forest District	2010	WFDC	
WRC WWO HC 01	**7.2**	Restore Hurcott pool wet woodland to as favourable a condition as possible within the constraints of the achievable water levels.	Hurcott Pool	2012	WFDC	EA FCE NE
WRC WWO HS 01	**6.17**	Ensure through the production and implementation of Water Level Management Plans that all priority wet woodlands identified under the SSSI PSA targets are hydrologically best placed to achieve favourable ecological condition.	Worcestershire	2010	EA	NE
WRC WWO HS 02	**6.1**	Ensure all wet woodland sites have a sustainable and achievable management plan in place and being implemented.	Hurcott Pool and other Wyre Forest District Council sites	2008	WFDC	EA NE
WRC WWO RE 01	**10.19**	As part of the implementation of the Water Level Management Plan on priority sites identified under the SSSI PSA targets carry out investigation into the effects of ground water levels on the ecological integrity and biodiversity of the sites.	Worcestershire	2017	EA	
WRC WWO RE 02	**10.14**	Investigate entomological relationships with wet woodland habitats.	Hurcott Pool	2009	WFDC	EA
WRC WWO SM 01	**12.5**	Where possible grow alder from seed taken from the site to re stock.	Hurcott Pool	2010	WFDC	

WRC WWO SM 02	**12.11**	Reduce the total area of Himalayan balsam by 75% and carry out measures to control the impact of other non-native species as necessary (including signal crayfish, mink and muntjac deer).	Hurcott Pool	2017	WFDC	EA NE
WRC WWO SM 03	**12.15**	Create artificial otter holts and roost sites for targeted bat species.	Hurcott Pool	2010	WFDC	
WRC WWO SU 01	**13.2**	Survey site to determine the effects of management works.	Hurcott pool	2010	WFDC	

EA – Environment Agency
FCE – Forestry Commission England
WWT – Worcestershire Wildlife Trust
NE – Natural England
WFDC – Wyre Forest District Council

Reedbeds
Habitat Action Plan

1. Introduction

Reedbeds are a priority UK BAP habitat. They are an important habitat for several Red Data Book bird and invertebrate species. Wetland habitats in general have been seriously compromised by human activity with many drained to improve the land for agriculture.

2. Current Status

2.1 Ecology and habitat requirements

Reedbeds are wetlands dominated by, but not necessarily composed purely of, stands of the common reed (*Phragmites australis*). It includes areas of reed that are both wet and dry at their base but where the water table is at or above ground level for much of the year. Wet reedbeds have more importance for biodiversity priority species. Ideally wet reedbeds should grade into dry reedbeds, tall fen and then willow scrub.

In the UK four species of birds are highly dependent on reedbeds for their survival: reed warbler (*Acrocephalus scirpaceus*), bearded tit (*Panurus biarmicus*), marsh harrier (*Circus aeruginosus*) and bittern (*Botaurus stellaris*). They also provide roosting and feeding sites for yellowhammer (*Emberiza citrinella*) and corn bunting (*Emberiza calandra*), plus migratory species such as swallow (*Hirundo rustica*) and sand martin (*Riparia riparia*). Several raptor species, such as hen harrier (*Circus cyaneus*), use reedbeds for roost sites in winter. Five Red Data Book invertebrates are closely associated with reedbeds.

2.2 Population and distribution

There are around 5000 ha of reedbed in the UK, but of the 900 or so sites contributing to this total only about 50 are greater than 20 ha, and these make a large contribution to the total area. Reedbeds are not common or extensive in Worcestershire, although they do have a general distribution. Reedbed sites usually have to be looked for rather than providing a characteristic feature of the landscape. They are found throughout the county mainly as narrow fringes of reed along rivers, canals and ditches rather than extensive areas.

Existing knowledge of reedbeds across the county estimates the bulk of the total resource at around 26 ha on over 20 sites. The largest areas are in the order of 5 ha at Hewell Park Lake SSSI and along the Droitwich Canal. Small pockets of reedbed in ponds and fringe habitats probably go undetected and will not be included in this estimate.

2.3 Legislation

Most of the more significant reedbeds in the UK are notified as SSSI/ASSI and many are notified as Wetlands of International Importance under the Ramsar Convention and as Special Protection Areas under the EC Birds Directive.

2.4 Summary of important sites

Hewell Park Lake SSSI lies within a Grade II listed Historic Park and Garden in the grounds of HMP Hewell Grange near Redditch. The lake is a shallow artificial

lake of around 25 acres surrounded by planted ornamental woodland, some of which falls within the SSSI designation. The lake margin has extensive areas of reed, which support one of the largest colonies of reed warbler in Worcestershire and contains vigorous colonies of the locally distributed sweet flag (*Acorus calamus*) and yellow loosestrife (*Lysimachia vulgaris*). The lake and its margins have considerable ornithological importance in a local context, providing breeding habitats for waterfowl that includes the great crested grebe (*Podiceps cristatus*). The lake is also interesting for its amphibians and reptiles.

Worcestershire Wildlife Trust nature reserves

- **Upton Warren SSSI** is a 26 hectare wetland reserve whose pools were formed by underground brine extraction, which caused subsidence and consequent flooding. The reserve is notable in the county for the birdlife it attracts. Sedge warblers (*Acrocephalus schoenobaenus*), lapwing (*Vanellus vanellus*), little ringed plover (*Charadrius dubius*), avocet (*Recurvirostra avosetta*) and common tern (*Sterna hirundo*) all breed here and many more ducks and waders visit on passage. Peregrine (*Falco peregrinus*) often hunt over the pools and bittern are also annual over wintering visitors to the extensive reedbeds on the pool margins.

- **Feckenham Wylde Moor SSSI** is an 11.5 hectare reserve that comprises the last remnants of an extensive marsh which once lay in the valley of the Brandon Brook. Originally drained for agriculture in around 1850, in more recent times the drainage system became blocked and some of the wetland characteristics of the area were restored. Base-rich clays of Keuper marl underlie the reserve and a surface layer of fen-peat, uncommon in Worcestershire, covers much of this. This reserve has much of the wildlife associated with marshland, peat and wet grassland habitats and is particularly notable for its dragonfly populations.

- **Wilden Marsh and Meadows SSSI** lies just south of Kidderminster alongside the River Stour. It covers an extensive 37.5 hectares of dry and marshy fields with small alder and willow woods, reedbeds and a network of drainage ditches. There are many old willow pollards and several black poplars. Marshland is scarce in Worcestershire and this reserve contains many plants now uncommon elsewhere including southern marsh-orchid (*Dactylorhiza praetermissa*), marsh cinquefoil (*Potentilla palustris*), marsh arrowgrass (*Triglochin palustre*), marsh pennywort (*Hydrocotyle vulgaris*) and lesser water parsnip (*Berula erecta*).

  The wet nature of the site was severely damaged by deep dredging of the River Stour and although it still has wet marshes it has never fully recovered, and is now dry in long, hot summers. The part of the site managed by WWT is primarily wet grazing land and, when possible, cattle are put on to the reserve to keep down the coarser plants and to limit invasive scrub. A programme of wetland restoration is currently underway at the site, led by the Environment Agency.

- Situated on the floodplain of the Rive Avon near Eckington, prior to its restoration **Gwen Finch** was a 20 hectare agriculturally drained semi-improved ryegrass lay with little or no wildlife value. Restoration works began in 1999 when WWT purchased the site and were completed in

2001. This involved the creation of 4 large scrapes, 3 of which were planted with reeds. A former drainage ditch together with sections of the river were re-profiled to create shallow areas. Water from the Berwick Brook is pumped onto the site via two windpumps with any excess returning to the river. By 2001 otters (*Lutra lutra*) were already using the reserve and redshank, yellow wagtail and reed warbler were breeding.

The **Droitwich Canal** has been abandoned as a commercial waterway since 1939. It supports frequently channel-wide reedbeds of County significance and the value of the canal corridor is enhanced further where it runs close to the River Salwarpe. The reedbeds hold one of the largest colonies of reed warbler in the county and provide breeding habitat for waterfowl, otters and a range of invertebrates including several species of dragonfly and damselfly. The canal fell into disrepair after abandonment but since the 1960s has been subject to various restoration efforts. The Droitwich Canals Trust was formed in 1973 and since that time has been working to gradually reopen both the towpaths and the canal itself to the public and recreational boat traffic. The Droitwich Canals Restoration Partnership, with British Waterways as lead partner, has to date secured over £10 million for the completion of the restoration project by 2008.

Westwood Great Pool SSSI is a man-made lake originally constructed as a major landscape feature. It now represents one of the largest areas of open water in Worcestershire, important for both its plant and bird communities, with peripheral areas of grassland and woodland. The lake and its margins support a wide variety of plants including yellow water lily (*Nuphar lutea*) and two national rarities, the eight-stamened waterwort (*Elatine hydropiper*) and the UK BAP species ribbon-leaved water plantain (*Alisma gramineum*), protected under schedule 8 of the Wildlife and Countryside Act. The latter species was first discovered in Britain at Westwood Great Pool in 1920, and is known from only three other sites in the country.

The northern and eastern margins of the Lake support extensive beds of common reed, great reedmace (*Typha latifolia*) and bulrush (*Schoenoplectus lacustris*). The marginal vegetation provides a valuable ornithological habitat, with breeding birds including reed warbler, great crested grebe, tufted duck (*Aythya fuligula*) and pochard (*Aythya ferina*). Westwood Great Pool is also one of the most important sites for over-wintering waterfowl in Worcestershire.

Oakley Pool SSSI consists of a pool surrounded by reedswamp, fen and grassland. The pool appears to have been formed by subsidence following underground brine extraction and is thought to be still extending due to continued subsidence. Besides common reed the marginal vegetation includes meadowsweet (*Filipendula ulmaria*), great reedmace, great and lesser pond sedge (*Carex riparia and C. acutiformis*) and great willow-herb (*Epilobium hirsutum*). The submerged plants include the locally uncommon hornwort (*Ceratophyllum submersum*).

The secluded nature of the area provides a valuable breeding site for a number of birds including the reed warbler, which has a large breeding colony in the reedswamp. The margins of the pool also provide secure breeding areas for little grebe (*Tachybaptus ruficollis*), tufted duck, pochard and ruddy duck (*Oxyura jamaicensis*). Grasshopper warbler (*Locustella naevia*) breed in the tall

vegetation at the north end of the pool. The site is regularly used for bird ringing and other ornithological research, which adds to its scientific importance.

3. Current factors affecting the habitat

- The small total area of habitat and small population sizes of several key species dependent on the habitat.
- The lack of or inappropriate management of existing reedbeds leading to drying out, scrub encroachment and succession to woodland.
- The invasion by alien species such as Himalayan balsam (*Impatiens glandulifera*) is causing devastating degradation and losses of wetland sites both in Worcestershire and the UK as a whole. Even sites that are nominally protected and / or under conservation management will not retain their wetland integrity without eradicating balsam. Invasion by balsam also prevents optimum grazing, which further damages the wet grassland element of sites.
- Excessive water abstraction leading to drying out.
- Pollution by road or agricultural runoff leading to damage by chemicals or silt build-up.
- Destruction due to recreational and development pressure and land use change.
- The isolation of sites leaving populations of species within them vulnerable with limited colonisation potential.
- The restoration work to the Droitwich Canal will involve major changes to the canal environment and surrounding habitats, including the near total loss of an extensive existing reedbed. It must be ensured that the biodiversity value of the canal corridor is maintained and that all losses of and damage to existing habitat are appropriately mitigated for.

4. Current Action

4.1 Local protection

About 16% of the reedbed sites in Worcestershire, covering about 30% of our reedbed resource, are notified as Sites of Special Scientific Interest, the largest being Hewell Park Lake. Other reedbeds are County Special Wildlife Sites.

4.2 Site management and programmes of action

Hewell Park Lake SSSI, sitting within 230 acres of neglected garden and parkland surrounding Hewell Grange mansion, became the property of HM Prison Service in 1946. Since that time both the Prison Service and the Hereford and Worcester Gardens Trust have worked to restore some of the original landscape features of the site. A new management plan was drawn up in 2006 that outlines conservation objectives for each of the discrete landscape feature / habitat 'parcels' identified within the park. A key challenge for HMPS in managing the site with regards to its biodiversity value is to integrate the demands of the various land-use pressures within the park, bearing in mind its modern-day function as an open prison and as a prison farm, with the aspirations of interested conservation bodies in restoring the historic features of the gardens and parkland, as well as fulfilling their legal obligations with regards to the SSSI.

The management plan contains a commitment to conserve the ecological interest of the lake, reedbeds and surrounding wet woodland. One of the key restoration projects due to take place at Hewell Grange is to restore (re-open) the Repton-

designed views across the lake which will involve the removal of willow (*Salix* sp.) and alder (*Alnus glutinosa*) scrub, rhododendron (*Rhodendron ponticum*) and some standard trees on the lake fringes. This will have the added effect of removing scrub encroachment from the reedbed. Hewell Park Lake has suffered in the past from over-abstraction of groundwater in the area and HMPS are working with Natural England and Severn Trent Water to ensure water levels are maintained.

There are a large number of **mineral extraction sites** within the county that have restoration plans involving the large-scale creation of areas of habitat for nature conservation gain. These sites are making a valuable contribution to increasing the reedbed habitat within Worcestershire and will to continue to do so as extraction phases end and restoration plans are implemented.

Worcestershire Wildlife Trust own and manage several of the county's most important sites for reedbed. The reserve at Hill Court Farm is being restored to incorporate extensive areas of wetland including wet grassland and reedbed.

The Environment Agency is leading on the restoration of **Wilden Marsh** nature reserve, with support from Worcestershire Wildlife Trust and Natural England. The proposal is to install a natural rock weir at the south end of the reserve and this is awaiting approval. Restoration of the ditch network will allow ongoing management of water levels and so will enable standing winter water to be reduced. Worcestershire Wildlife Trust has reintroduced grazing on their part of the reserve and is controlling the invasive Himalayan balsam.

Many of the county's reedbeds, in particular those of SSSI status, will be subject to **water level management plans**. The Defra Water Level Management Plan (WLMP) initiative provides a means by which the water-level requirements for a range of activities in SSSIs and Natura 2000 sites, including conservation, agriculture and flood defence, can be balanced and integrated. Water-level management is a key part of achieving favourable condition on many designated sites. WLMPS are developed with landowners in order to deliver sustainable water level management and environmental improvements.

The **Higher Level Environmental Stewardship Scheme** contains options for the maintenance, restoration and creation of reedbeds and capital grants are available for water level control and distribution structures.

The increasing use of **Sustainable Drainage Systems (SuDS)** has resulted in the creation of a number of small new reedbed sites as part of village sewage treatment works and other developments.

- The Environment Agency has a policy to promote SuDS as a technique for the sustainable management of surface and groundwater and they have published several guides and good practice notes for incorporating SuDS features into the design of developments.
- CIRIA (Construction Industry Research and Information Association) are running an initiative to promote good practice in the implementation of sustainable drainage systems, providing advice, information and training events on the use of SuDS.
- During the redevelopment of farm buildings during 2004 Worcestershire Wildlife Trust installed a reedbed filtration system to take all grey water

produced at their offices and education centre. The Trust also uses training events for local planning authorities and developers to recommend the use of SuDS and soft engineering solutions.

The RSPB, English Nature, Broads Authority and the Reedbed Growers Association have published a leaflet on 'Reedbed Management for Bitterns' and the management guide 'Reedbed Management for Commercial and Wildlife Interests Handbook' to encourage the management and creation of reedbeds.

Natural England, FWAG, Worcestershire Wildlife Trust and RSPB staff can provide advice on appropriate management, rehabilitation, extension and creation of reedbeds.

4.3 Survey, research and monitoring

In 1998 **Worcestershire Wildlife Trust** conducted an Environment Agency-funded wetland survey of 84 sites: 54 that had previously been surveyed in 1978 and an additional 30 sites some of which had been discovered in the intervening years. Each site was divided into its compartmental homogenous stands of a single NVC community type and a full species list collected for each. In 1998, sites ranked as containing proportionately the highest amount of either wet (S26) or dry (S4) reedbed were Northwick Marsh, Wilden Marsh and Meadows, Feckenham Wylde Moor, Grimley Brick Pits, Podmore Pool, Oakley Pool, Hurcott Pool and Shrawley Brick Pits and Marsh. The survey found a total of 8.56 ha of S4 and S26 across all the sites surveyed, with the largest single stand of S4 at Oakley Pool and S26 at Feckenham Wylde Moor. The report emphasises that as rivers, canals and standing open water bodies were not included within the survey, this total probably represented only around one third of the reedbed and reedswamp present in the county (Liley, 1999).

In 1999 English Nature, the Environment Agency and the RSPB commissioned a report " The Re-creation options for the River Severn/Avon floodplain wetlands" (Ecoscope, 1999) in response to widespread concern over the dramatic loss of floodplain habitats and key species of flora and fauna, especially breeding waders such as lapwing, snipe, curlew (*Numenius arquata*) and redshank, within the river catchment. The study evaluated the potential for restoring UK Biodiversity Action Plan (BAP) habitats and target species on eighteen floodplain areas within the Severn and Avon Vales Natural Area. The report provided a basis for strategic planning and targeting of resources and in 2000 the **Severn and Avon Vales Wetlands Partnership** (SAVWP) was established. Key objectives include the creation and sustainable management of a mosaic of floodplain habitats such as wet grassland, reedbed and wet woodland and the protection of the wildlife that these habitats support.

5. Associated Plans

Canals, Fen and Marsh, Rivers and Streams, Ponds and Lakes, Wet Grassland, Wet woodland.

6. Vision Statement

To exploit all opportunities for the creation of reedbed habitat, both for nature conservation value alone and for the valuable role that this habitat can play in sustainable water and waste management.

7. Targets

Target Type	Target text	Baseline value	Target value	Target Timescale
Maintain extent	Maintain extent of 30ha of existing habitat	30ha	30ha	2017
Expand	Create 100 ha of reedbed	30 ha	130 ha	2017

8. Actions

Action code	Action Category	Action Text	Location	Action Timescale	Lead organisation	Support organisation
See www.ukbap-reporting.org.uk for actions that relate to reedbed habitat. Actions for reedbed are held within the following LBAPs: • Biological Recording and Information • Canals • Policy, Grants and Legislation						

References and further information

Liley, M (1999). *Worcestershire's Wetlands: report of 1998 botanical survey.* Worcestershire Wildlife Trust.

www.severnwetlands.org.uk - website of the Severn and Avon Vales Wetlands Partnership.

www.ciria.org.uk - Construction Industry Research and Information Association

www.naturalengland.org.uk - Natural England

www.worcswildlifetrust.co.uk - Worcestershire Wildlife Trust

www.environment-agency.gov.uk - Environment Agency

www.britishwaterways.co.uk - British Waterways

www.worcs.com/dct/ - Droitwich Canals Trust

Fen and Marsh Habitat Action Plan

1. Introduction

Fen and marsh vegetation is groundwater-fed permanently, seasonally or periodically waterlogged peat, peaty or mineral soils where grasses do not predominate. It also includes emergent vegetation or frequently inundated vegetation occurring over peat or mineral soils. It does not include areas of carr that are greater than 0.25ha nor wet grassland (with the exception of purple moor grass, reed, or sweet-grass dominated vegetation), which is included in the Coastal and floodplain grazing marsh habitat type (UKBAP) and Lowland wet grassland (County BAP).

UKBAP Priority habitats relating to this HAP are Fens, Coastal and floodplain grazing marsh, Saltmarsh, and Purple moor grass and rush pastures.

The UK is thought to host a large proportion of fen surviving in the EU. As in other parts of Europe, fen vegetation has declined dramatically in the past century. Peatland habitats have been identified as major contributors to carbon storage and their degradation leads to the release of thousands of tonnes of CO_2 into the atmosphere every year.

Within the county fen and marsh, as with other wetland habitats, have undergone a serious decline in extent and quality. Sites are fragmented, generally small in size and under threat from a range of factors (see below). They were common throughout the county and would have been found on low-lying river floodplains particularly on the Severn and Avon in conjunction with wet grasslands. These habitats still support some of Worcestershire's rarest species in sedge or tall herb dominated mire and swamp communities.

2. Current Status

2.1 Description of Habitat

Fens are peatlands that receive water and nutrients from the soil, rock and ground water as well as from rainfall: they are minerotrophic. Two types of fen can broadly be distinguished: topogenous and soligenous. Topogenous fens are those where water movements in the peat or soil are generally vertical. They include basin fens and floodplain fen. Soligenous fens, where water movements are predominantly lateral, include mires associated with springs, rills and flushes in the uplands, valley mires, springs and flushes in the lowlands, trackways and ladder fens in blanket bogs and laggs of raised bogs.

Fens can also be described as `poor-fens` or `rich-fens`. Poor-fens, where the water is derived from base-poor rock such as sandstones and granites occur mainly in the uplands, or are associated with lowland heaths. They are characterised by short vegetation with a high proportion of *Sphagnum* spp. bog mosses and acid water (pH of 5 or less). Rich-fens are fed by mineral-enriched calcareous waters (pH 5 or more) and are mainly confined to the lowlands and where there are localised occurrences of base-rich rocks such as limestone in the uplands. Fen habitats support a diversity of plant and animal communities. Some can contain up to 550 species of higher plants, a third of our native plant species,

up to and occasionally more than half the UK`s species of dragonflies, several thousand other insect species, as well as being an important habitat for a range of aquatic beetles.

Marsh is found on mineral soils and is defined as periodically inundated pasture or meadow with ditches, which help to maintain water levels, containing standing brackish or freshwater. The ditches are especially rich in plants and invertebrates. Mostly grazed, some are also cut for hay or silage. Sites may contain permanent ponds, seasonally wet hollows and areas of emergent swamp although not tall fen species like reeds. Areas of marsh are important for breeding waders especially *Vanellus vanellus* lapwing, *Numenius arpuata* curlew and *Gallinago gallinago* snipe. However, only a very small proportion of marsh is semi-natural and capable of supporting a high diversity of plant species.

Swamp and tall herb fen habitats are characterised by the fact that the water table is at or above the soil surface for most of the year. They tend to be botanically species-poor (e.g. reedbeds) relative to other wetland habitats.

Fen and marsh habitats are often found in association with other wetlands such as open water, ditches, lowland wet grassland and wet woodland.

2.2 Distribution and extent

A county wetlands survey in 1998 by Liley (1999) indicates that remaining fen and marsh communities total only 53ha in area. Although this is a minimum estimate (some small sites may not have been surveyed likewise riparian fen habitats e.g. along rivers or ditches) it is felt that this is still an accurate representation of extent (Liley, pers. comm. 2007).

Table 1. Description of NVC communities containing fen, marsh and swamp vegetation within Worcestershire as surveyed by Liley (1999).

NVC Code	Community Description
S3	*Carex paniculata* sedge swamp (0.16ha) Dominated by tussocks of greater tussock sedge with open water or silt and a sparse flora between, sometimes with young willows or alders.
S5	*Glyceria maxima* swamp (2.09ha) Dominated by dense stands of reed sweet-grass, which may form large collapsed mats with little else other vegetation.
S6	*Carex riparia* swamp (4.79ha) A dense canopy of greater pond sedge up to 1 metre high, usually with a poor associated flora.
S7	*Carex acutiformis* swamp (7.13ha) Similar to S6, but dominated by the lesser pond sedge. Sometimes a sparse tall herb component.
S8	*Scirpus lacustris* swamp (0.16ha) This community, dominated by common bulrush, is more often found along rivers in Worcestershire but sometimes occurs around pools and very wet marshes.
S9	*Carex rostrata* swamp (0.3ha) Bladder sedge dominates this species poor swamp, which tends to occur in fairly shallow water in pools or in swamps.
	Carex vesicaria swamp (0.36ha)

S11	Although bottle sedge often dominates this community in shallow water there can be other species such as soft rush, sometimes in reasonable amounts.
S12	*Typha latifolia* swamp (4.18ha) Common reedmace is always dominant, frequently with no other species present.
S13	*Typha angustifolium* swamp (0.56ha) This is dominated by lesser reedmace, which prefers more basic water around pools with silty substrate.
S14	*Sparganium erectum* swamp (1.33ha) This typical sub-community is normally species poor with the branched bur-reed overwhelmingly dominant.
S18	*Carex otrubae* swamp (0.06ha) False fox sedge swamp normally forms narrow and usually fragmented stands between other communities.
S19	*Eleocharis palustris* swamp (0.27ha) Common spike rush forms narrow strips around pools, often in such small amounts to not be measurable.
S20	*Scirpus lacustris* ssp *tabernaemontanii* swamp (3.36ha) Glaucous clubrush is always dominant, sometimes with other species but often alone.
S22	*Glyceria fluitans* water margin (2.0ha) This is dominated by a low floating mat of floating sweet-grass, normally around the edges of pools. Sometimes other species are present in shallow water.
S23	Mixed water margin vegetation (0.49ha) This is a ditch/river/pond margin habitat, normally narrow and with a wide range of plants such as *Myosotis scorpioides* water forget-me-not, *Mentha aquatica* water mint, *Apium nodiflorum* fools watercress and *Berula erecta* lesser water parsnip.
S28	*Phalaris arundinacea* tall herb fen (3.36ha) This is always a species poor community dominated by reed canary grass.
SM23	*Spergularia marina-Puccinella distans salt marsh* (0.26ha) Sea spurrey and salt marsh grass dominate a sparse turf where salt excludes most species
SM28	*Elymus repens* salt marsh (0.7ha) This community is dominated by dense stands of salt tolerant couch grass within which few other plants grow.
M22	*Juncus subnodulosus-Cirsium palustre* fen-meadow (8.42ha) Dominated by dense blunt flowered rush with other rushes and sedges. Marsh thistle often common. Mainly on base rich soils and peat.
M23	*Juncus effusus/acutifflorus-Galium palustre* rush-pasture (3.4ha) Either soft or sharp flowered rushes dominate often within a species rich sward, marsh bedstraw common.
M25	*Molinia caerulea-Potentilla erecta* mire (0.51ha) Purple moor grass dominates this habitat with other acid wet ground species such as cottongrass, tormentil and some rushes.
M27	*Filipendula ulmaria-Angelica sylvestris* mire (7.61ha) Meadowsweet is normally very dominant with angelica being one of a

	number of minor tall herbs. Usually on rich soils protected from grazing.
WE27	*Epilobium hirsutum* weed community (1.36ha) Greater willowherb dominates this tall herb community on damp ground normally along riverbanks and in areas of ungrazed marsh.
Unknown	Dominants *Scirpus sylvaticus-Carex pseudocyperus* (0.76ha) On several sites, areas of swamp dominated by wood clubrush and cyperus sedge occur.

Total = 53.62ha

The wetland survey looked at the 88 most important wetlands in the county. Obviously, there are other wetland communities to be found outside of theses 88 sites but these are expected to be small and found in conjunction with other habitats, e.g. riparian zones and field corners. Sedge and tall herb fen communities are considered to be most under-represented perhaps adding another 100ha in total.

2.3 Legislation and site designation

There are 18 SSSIs designated at least in part for their fen, marsh and swamp interest. Of these the largest are Wilden Marsh, Stourvale Marsh, Puxton Marsh, Upton warren and Feckenham Wylde Moor.

2.4 Summary of important sites

Historically, the largest wetland complex in the county was Longdon Marsh and this would have supported large areas of fen, marsh and swamp. However, the marsh was drained in the late nineteenth century and little semi-natural habitat now remains.

At Upton Warren near Droitwich the second most important British inland saltmarsh has developed around a series of saline pools created through subsidence as a result of brine extraction.

In the east of the county a series of fens occur notably Ipsley Alders and Feckenham Wylde Moor SSSIs. Both are examples of “rich” fens. Examples of acid marsh or fens are rare in the county but small tracts can be found at Castlemorton and Ashmoor commons.

3. Current factors affecting the habitat

- Groundwater abstraction and/or field drainage has lowered water tables in some areas so that many important fen and marsh sites are now drying out leading to changes in vegetation communities. This results in a loss of quality and extent of target habitat.

- Reduction in ground water levels has resulted in the oxidation and erosion of organic soils and the loss of dependent flora and fauna. Where organic soils are lost from wetland sites future restoration becomes difficult or even impossible.

- Geographical and ecological isolation of sites has increased as abstraction and drainage have been carried out. Genetic exchange

between these sites is therefore decreasing and individual sites are becoming more vulnerable to environmental change.

- Engineering works for flood alleviation (including river channel re-sectioning and creation of flood defences) has reduced water supply to floodplain sites e.g Wilden Marsh SSSI. This results in a loss of quality and extent of target habitat.

- Water quality in many rivers has become increasingly eutrophic as a result of agricultural and urban pollution. Floodplain sites inundated with this water will become enriched with plant nutrients which in turn will result in changes to plant communities

- Increasing encroachment of alien species, for example *Impatiens glandulifera* Himalayan balsam and *Fallopia japonica* Japanese knotweed.

- Climate change may affect rainfall patterns resulting in changes to water supply to sites (e.g. total amount, seasonality etc).

- Inappropriate management of sites, in particular those within urban fringe areas. There may also be problems with anti-social behaviour (fly-tipping, arson etc).

- Housing and industrial development can lead to additional abstraction from aquifers and further lowering of the water table.

- Ineffective dissemination of advice and information from nature conservation organisations to site managers/owners.

- Limited funding available through Natural England's Environmental Stewardship Scheme to protect existing sites or to fund restoration/creation programmes.

- Poor economic incentive for landowners to manage fen and marsh habitats appropriately. More advice and resources are required to encourage activities such as local branding schemes to "add value" to these habitats and encourage sympathetic management.

4. Current Action

4.1 Local protection

SSSI designations are used to protect some of the most valuable sites within the county. Special Wildlife Sites (SWS) are non-statutory but help identify valuable sites for protection through the development control process.

4.2 Habitat management and programmes of action

- Nature Reserves managed by Worcestershire Wildlife Trust.

- SSSI sites managed by Natural England, Worcestershire Wildlife Trust and private landowners.

- Natural England, Environment Agency and Worcestershire Wildlife Trust are undertaking a feasibility study into the restoration of Wilden Marsh SSSI to favourable condition.

- Many of the county's most important fen and marsh sites are managed under agri-environment agreements (CSS and ES) overseen by Natural England.

- Worcestershire Wildlife Trust provides advice to owners/managers of sites on management/creation and restoration opportunities.

4.3 Survey, research and monitoring

- The Worcestershire Habitat Inventory project being undertaken by Worcestershire County Council will result in a land use and habitat inventory on a field-by-field basis of the whole county.

- Botanical and hydrological monitoring being carried out at Wilden Marsh SSSI.

- Worcestershire Wildlife Trust Wetlands Survey includes all fen and marsh totalling 88 sites.

- Lakes Survey carried out by Worcestershire Wildlife Trust includes some riparian information that covers areas of fen and marsh.

- It is intended that the SWS review being undertaken by Worcestershire Wildlife Trust on behalf of the Worcestershire Special Wildlife Site Partnership will identify the current status of fen and marsh SWS and where action is needed to conserve and enhance the resource.

5. Associated plans

Reedbeds, Lowland Wet Grassland, Wet Woodland, Ponds and Lakes, Rivers and Streams, Canals, Otter, Water Vole, Great Crested Newt.

6. Vision statement

To conserve and enhance the quality and extent of all current fen and marsh sites and create and restore additional sites in order to enhance ecological resilience in the light of climate change and other environmental pressures.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Maintain extent	Maintain extent of 112ha of existing habitat	112ha	112ha	2017
Restore	Restore 8ha of habitat on the basis of greatest ability to assist with adaptation to climate change	112ha	120ha	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Supporting Organisations
WRC FAM CA 01	**2.1**	Use existing sites to demonstrate and encourage good management practice.	Feckenham Wylde Moor	2017	WWT	NE
WRC FAM CA 02	**2.11**	Collate existing information into an advice pack on management of fen and marsh habitats and distribute as appropriate to landowners and conservation agencies.	Forest of Feckenham	2010	WWT	SAVWP
WRC FAM CA 03	**2.15**	Provide 5 training opportunities for landowners on management of fen and marsh sites.	Worcestershire	2017	FWAG	WWT
WRC FAM HS 01	**6.15**	Identify Special Wildlife Sites where management needs modifying to benefit the site, seek resources and liaise with land managers to implement favourable management.	Forest of Feckenham	2010	WWT	WWT

WWT – Worcestershire Wildlife Trust **NE** – Natural England **SAVWP** – Severn and Avon Vales Wetlands Partnership
FWAG – Farming and Wildlife Advisory Group

SAVWP – Severn and Avon Vales Wetlands Partnership: Environment Agency, Natural England, The Wildlife Trusts, Farming and Wildlife Advisory Group, Defra, National Farmers Union, Association of Drainage Authorities, County and Local Councils, Royal Society for the Protection of Birds, Wildfowl and Wetlands Trust, Severn Trent Water.

References and further information

Liley, M (1999). *Worcestershire's Wetlands: report of 1998 botanical survey.* Worcestershire Wildlife Trust.
http://www.naturalengland.org.uk/press/releases2007/161107.htm

Wet Grassland Habitat Action Plan

1. Introduction

Wet grassland is included within the UKBAP priority habitat Coastal Floodplain and Grazing Marsh. It supports many important species some of which are rare and/or declining. It has suffered an estimated 40% loss in area within the UK between the 1930s and the 1980s. This level of loss is very likely to have been repeated in Worcestershire.

2. Current status

2.1 Description of habitat

UK wet grasslands provide valuable habitat for a range of native plants, birds and animals. They develop on land which is periodically flooded or waterlogged by freshwater and where land management practices (cutting for hay, grazing) promote swards dominated by short grasses, rushes and sedges. They are not dominated by reeds. The term wet grassland is used to refer to several wetland types. Semi-natural floodplain grassland occurs where floodplains are subject to semi-natural hydrological regimes (e.g. where flood embankments have been constructed). Naturally functioning floodplains are rare in the UK and do not occur in the county in any meaningful quantity. Washlands are embanked areas created for flood storage (e.g. the Ouse Washes) but do not occur in Worcestershire. Water meadows were created to be deliberately flooded and thus to raise hay yields or provide early grass growth for cattle. Water management was undertaken using a complex system of sluices and drains. Today, few remain in working condition with some examples still present in the county. Lastly, there are many examples of wet grassland coinciding with ponds, lakesides and drainage channels as part of the natural hydrosere. Within the county there are many examples of small but nevertheless important wet grasslands in this category. All however have suffered a loss in extent and ecological resilience through drainage and intensive land management practices.

2.2 Distribution and extent

Wet grassland is now mainly confined to the floodplains of England but much of what remains has been agriculturally improved and is of reduced value to wildlife. Some estimates of the historical resource indicate there were at least 1.2 million ha but now less than 0.2million ha remains. In Worcestershire most of the resource is to be found in the floodplains of the Severn and Avon Vales with important semi-natural wet grasslands in the Stour valley notably the marshes of Wilden, Puxton and Stourvale. These sites also contain other habitats including limited areas of fen and marsh. The loss of such large areas of wet grassland has had an adverse impact on breeding waders such that today, in the Worcestershire Severn and Avon vales, *Gallinago gallinago* snipe no longer breed and populations of *Tringa tetanus* redshank, *Vanellus vanellus* lapwing and *Numenius arpuata* curlew are much reduced.

2.3 Legislation

Legislation most pertinent to the conservation, restoration and creation of wet grasslands in the county is:

- **Water Framework Directive (2000)** – requires improvements to the ecological quality of water bodies, flood and drought attenuation and restoration of groundwater.
- **Natural Environment and Rural Communities Act (2006)** – requires public bodies to have regard to the purpose of conserving biodiversity in exercising their functions.
- **Wildlife and Countryside Act (1981)** as amended by the **Countryside and Rights of Way Act (2000)**
- **EC Council Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna 1992 ('The Habitats Directive')** – this introduces protection for a suite of sites for birds (Special Protection Areas) and other fauna and flora (Special Areas of Conservation); the so-called Natura 2000 network. There is also protection for a list of species that also require special conservation measures.

2.4 Summary of important sites

Several sites incorporating wet grassland habitats are protected under various designations within the county. Examples are Twyning Meadows SSSI and Stourvale SSSI, Smithmoor Common and the Kempsey Hams complex Special Wildlife Sites, and nature reserves managed by Worcestershire Wildlife Trust such as Hill Court Farm and the Blacklands.

3. Current factors affecting the habitat

- Land drainage has led to wet grassland sites becoming hydrologically isolated and vulnerable.
- River and groundwater abstraction and engineering works for flood alleviation may reduce water availability to floodplain and spring-fed sites.
- Eutrophication of sites through inundation with nutrient-rich (flood) water has led to a reduction in sward diversity and the dominance of vigorous grass species.
- Reduction in ground water levels has resulted in the loss of flora and fauna dependant on high groundwater conditions.
- Ecological isolation due to fragmentation of the resource inhibits movement of species between sites due to less favourable linking corridors.
- Inappropriate management of sites, in particular conversion from hay to silage cutting, over/under grazing and applications of fertilisers.
- Climate change causing fluctuating and inconsistent rainfall patterns resulting in inundation and drought.
- Development pressure – developers lack awareness of the value and sensitivity of potential development sites.
- Weakness in information distribution between relevant bodies and individuals.
- Inconsistency in availability of grant funding that can encourage better long-term management of existing sites and help financially with restoration and creation projects.
- Poor economic incentive for landowners. More advice and real outcomes are required to encourage activities such as local branding.

4. Current Action

4.1 Local protection

SSSI designations are used to protect some of the most valuable sites within the county. Special Wildlife Sites (SWS) are non-statutory but help identify valuable sites for protection through the development control process.

4.2 Habitat management and programmes of action

- Nature Reserves managed by Worcestershire Wildlife Trust.
- SSSI sites managed by Natural England and landowners.
- Severn and Avon Vale Partnership – working with partners to improve habitat management, restoation and creation.
- Natural England Environmental Land Management Schemes; CSS and HLS.
- Worcestershire Wildlife Trust provides advice, consultancy services and occasionally capital resources to owners/managers of sites requiring creation and/or restoration.
- Landscapes for Living initiative – seeks to deliver a 50-year biodiversity vision for the county underpinned by the development of a county-wide ecological network. Restoration of a more natural hydrological regime within rivers and floodplains will be key in implementing this.

4.3 Survey, research and monitoring

- Worcestershire Habitat Inventory – land use and habitat inventory on a field-by-field basis of the whole county.
- SAVWP – water level management study into Longdon Brook to support wetland delivery.
- SAVWP – monitoring of wet grassland sites created or restored by the partnership to identify rates of species re-colonisation after water level management has been undertaken.
- Worcestershire Wildlife Trust Wetlands Survey (1998) - a survey of approximately 80 of the county's most biologically valuable wetlands including wet grassland sites.
- Worcestershire Wildlife Trust Lakes Survey (2002) – includes riparian habitat details.
- Special Wildlife Site review undertaken by the SWS Partnership – identifies the county's most important sub-SSSI sites including wet grasslands.
- Worcestershire Wildlife Trust Hill Court Farm wet grassland reserve – site hydrology is monitored using a matrix of dipwells.

5. Associated Plans

Rivers and Streams, Wet Woodland, Ponds and Lakes, Fen and Marsh, Otter, Water Vole, Black Poplar.

6. Vision Statement

To conserve and enhance the quality and extent of all current wet grassland sites and create and restore additional sites in order to enhance ecological resilience (particularly in floodplains by restoring more natural hydrological regimes) in the light of climate change and other environmental pressures.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Maintain extent	Maintain extent of 860ha of existing habitat	860ha	860ha	2017
Restoration	Identify opportunities for restoring hydrological regimes in floodplains and implement projects to restore 112ha of wet grassland habitat	860ha	972ha	2017
Expansion	Create 22ha of wet grassland habitat	972ha	994ha	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Supporting Organisations
WRC LWG AP 01	**1.6**	Ensure that the Severn Catchment Flood Management Plan includes measures and policies that conserve and enhance existing and planned wet grassland sites.	Worcestershire	2009	EA	WWT, SAVWP, NE
WRC LWG CA 01	**2.1**	Use existing sites to demonstrate and encourage good management practice.	Hill Court Farm, Longdon	2017	WWT	
WRC LWG CA 02	**2.11**	Collate and distribute existing information on wet grassland habitat management to relevant land managers.	Forest of Feckenham, Severn and Avon Vales	2010	WWT	SAVWP, FWAG
WRC LWG HC 01	**7.4**	Integrate BAP habitat gains into capital and management projects.	Worcestershire	2017	EA	SAVWP
WRC LWG HS 01	**6.15**	Identify Special Wildlife Sites where management needs modifying to benefit the site, seek resources and liaise with landmanagers to implement favourable management.	Forest of Feckenham, Severn and Avon Vales	2010	WWT	SWS Partnership, SAVWP, FWAG

WWT – Worcestershire Wildlife Trust **FWAG** – Farming and Wildlife Advisory Group **WCC** – Worcestershire County Council
EA – Environment Agency

SAVWP – Severn and Avon Vales Wetlands Partnership consists of the following organisations: Environment Agency, Natural England, The Wildlife Trusts, Farming and Wildlife Advisory Group, Defra, National Farmers Union, Association of Drainage Authorities, County and Local Councils, Royal Society for the Protection of Birds, Wildfowl and Wetlands Trust, Severn Trent Water.

The **SWS Partnership** consists of the following organisations: Bromsgrove District Council, Country Landowners Association, Environment Agency, Farming and Wildlife Advisory Group, Malvern Hills District Council, National Farmers Union, Natural England, Redditch Borough Council, Worcester City Council, Worcestershire County Council, Worcestershire Wildlife Trust, Wychavon District Council, Wyre Forest District Council.

Canals
Habitat Action Plan

1. Introduction

Canals provide a green corridor into urban areas, consisting of a mixture of freshwater and terrestrial habitats that may be less intensively managed than the surrounding land and can be very important for wildlife.

2. Current Status

2.1 Description of habitat

Wetland habitats often occur adjacent to the canal, with the towpath, hedge or other boundary feature adding further wildlife value to the canal environment. These associated habitats are often rich in species, some of which are relicts of formerly widespread habitats such as unimproved grassland, marsh and carr. Supply reservoirs and feeder streams are also often rich habitats. All of the county's canals have extensive bankside tree resources. Canals can help in the re-colonisation of the countryside by *Lutra lutra* otter and canal tunnels can provide roosting, foraging and hibernation sites for bat species. If the climatic conditions within the tunnel are right and suitable cracks and crevices are present bats are also known to use canal tunnels for breeding.

On heavily used canals the turbid water caused by boat traffic results in a generally poor submerged aquatic flora, although in places some good marginal emergent vegetation including *Typha* sp. reedmace, *Schoenoplectus lacustris* bulrush and *Lythrum salicaria* purple loosestrife exists. Canal sections with soft banks and fringing vegetation can support *Arvicola terrestris* water vole populations although in Worcestershire this species is now restricted to the canals (and other watercourses) in and immediately around the Bromsgrove area. *Triturus cristatus* great crested newts are occasionally found in canals and also in overflow ponds at locks, although the presence of fish in most of our canals is generally a deterrent. *Bufo bufo* common toads are regularly found in canals: this species appears to be in an overall decline nationally and so canals may be important in the species' survival.

2.2 Distribution and extent

Construction of canals in the UK took place predominantly between 1750 and 1830 although some were built much earlier and others later. The network covers much of the country with a concentration of canals in the London area and the Midlands. British Waterways owns much of the network and has responsibility for 2,000 miles of canals and navigable rivers; the remaining canals are in private or local authority ownership.

There are three canals that pass through the county of Worcestershire. The Worcester and Birmingham Canal starts at the River Severn in Worcester and leaves the county at Wast Hills near King's Heath. The Staffordshire and Worcestershire Canal starts at the River Severn at Stourport-on-Severn and follows the River Stour for 13km to the county boundary. The third is the Droitwich Canal, which starts at the River Severn and follows the River Salwarpe to Droitwich where the Droitwich Junction Canal connects it to the Worcester and Birmingham Canal at Hanbury.

2.3 Legislation

British Waterways has a duty under the British Waterways Act 1995 to further the conservation and enhancement of natural beauty and the conservation of plants, animals and geological or physiographical features of special scientific interest and to balance this against the requirements of canal users.

Canals fall under the Water Framework Directive legislation that requires all inland and coastal waters within each defined river basin district to reach at least good status by 2015 through the establishment of environmental objectives and ecological targets for surface waters. This legislation will be a big driver of conservation work once targets and objectives are set.

Watercourses in the UK are given Statutory Water Quality objectives. The classification system aims to describe the chemical quality required to support different river ecosystems, known as the River Ecosystem Classification Scheme. RE1 is the highest objective but most canals have low RE4 or RE5 objectives. It is the responsibility of the Environment Agency to implement these objectives.

Otters, bats and water voles are all protected by the Wildlife and Countryside Act 1981 (as amended). This should be taken into account during all maintenance and management works.

Over 100 canals in the UK are designated as SSSIs and many more as local Wildlife Sites.

2.4 Summary of important sites

The **Staffordshire and Worcestershire Canal** does not in general have a very rich flora, however some of the lock gates and walls support occasionally notable species of fern, liverwort and moss. Where the River Stour runs close to the canal there are important wetland sites such as Wilden Marsh and Meadows, Puxton Marsh and Stourvale Marsh (all designated SSSI and SWS) and Wolverly Marsh SWS. The canal provides additional habitat to species like the otter. During routine maintenance works on this canal British Waterways have often encountered crayfish once the water has been drawn down around lock gates but it is not known what species. *Austropotamobius pallipes* white-clawed crayfish are found further up the canal in Staffordshire.

The **Worcester and Birmingham Canal** has frequent though generally narrow stands of *Typha latifolia* common reed and a good diversity of other emergents in its margins. Other valuable habitat includes occasional wetlands associated with winding holes, marginal ditches, weirs and reservoirs. Mature woodland is found in tunnel cuttings and on embankments and much of the canal has a continuous established hedge boundary. The canal is particularly important as it maintains some of the last known water vole populations in Worcestershire.

The **Droitwich Canal** has been abandoned since 1939. The Barge Canal section was opened in 1771 to connect Droitwich with the River Severn, followed by the Junction Canal in 1854 that joined the Barge Canal to the Worcester and Birmingham Canal at Hartlebury. It supports frequently channel-wide reedbeds of county significance and the value of the canal corridor is enhanced further where it runs close to the River Salwarpe. The reedbeds hold the largest colony of *Acrocephalus scirpaceus* reed warbler in the county and provide breeding

habitat for otter, waterfowl and a range of invertebrates including several species of dragonfly and damselfly. Otters are known to use the canal close to where it joins the River Severn. Great crested newts certainly occur in the disused arm of the Droitwich Canal by the Droitwich Rugby Club.

3. Current factors affecting the habitat

- The restoration work to the Droitwich Canal will involve major changes to the canal environment and surrounding habitats, including the near total loss of an extensive existing reedbed. It must be ensured that the biodiversity value of the canal corridor is maintained and that all losses of and damage to existing habitat are appropriately mitigated for.

- Installation of sheet and steel piling jeopardises water vole populations by reducing the amount of habitat available for possible expansion of existing colonies. Alternatives to such features exist for most situations and should be preferred.

- Increasingly canal towpaths are being used for recreation, particularly walking, fishing and cycling. They are often promoted as 'green routes' and in many places conflicts between user groups occur. Associated towpath improvement can result in serious loss of habitat. Widening or installing hard surfacing may necessitate hard channel bank protection, the loss of unimproved grass verges and impact on boundary hedges. The use of towpaths as convenient places to lay utility cable links also has the potential to damage the wildlife value of the canal corridor. British Waterways' vision is to double the amount of visitors to our canals by 2012 and they are actively encouraging the responsible recreational use of canals and their towpaths. This requires responsible management and monitoring to ensure that this is not at the cost of biodiversity.

- Canals are a significantly different freshwater system compared with still or natural running water habitat. Water quality, especially in navigable canals, is generally perceived as poorer though much of the difference is due to higher turbidity and lack of flow. Canals often show poor chemical quality despite maintaining healthy fish populations. As a result of this canals tend to be given lesser conservation objectives due to naturally low dissolved oxygen levels. However, other parameters that have the potential to harm wildlife such as ammonia, pH, copper and zinc are found at low levels in canals.

- The contribution that canals make to biodiversity in the county and UK in general is not fully appreciated. This stems from both a lack of systematic survey and from a commonly held belief that they are generally too polluted to sustain wildlife. This view may undermine efforts to improve their worth for wildlife.

- Although canals were constructed to take boats, the passage of powered boats does damage the flora through direct physical contact, wash and increased turbidity. The growth of the boating industry is likely to place pressure on canal biodiversity through increased turbidity, disturbance and bank erosion. There is also an increased pressure for tidy and well-managed towpath vegetation, which may conflict with biodiversity.

- Most canals currently have a 12-month fishing season (apart from designated SSSI's and SAC's that have a closed season) and this may adversely affect bankside vegetation, birds and other wildlife on the canal. British Waterways are considering a closed season policy on sections of canal that are important to biodiversity and fish spawning. Leased angling is regulated and issues such as damage to the banks can be addressed, whilst unregulated angling can cause conflict with biodiversity. Litter from angling is an issue, often encouraging *Rattus norvegicus* brown rat.

- Over feeding of waterfowl, especially *Branta canadensis* Canada geese, results in excessive fouling, which impacts on local water quality, and damage to canal bank vegetation. Left over food can encourage the brown rat, which in turn can have serious impacts on species such as the water vole.

- The canal bank opposite to the towpath, known as the off-side, is commonly in different ownership to the canal itself. Where canals are embanked or in cuttings, ownership usually changes at the toe or top of the bank. The offside edge may suffer from the same problems that rivers suffer from such as overgrazing or ploughing to the bank resulting in erosion, excessive nutrient inputs and loss of riparian habitat.

- Non-native plant species entering the canal system, either as escapees from garden ponds or by people deliberately placing them in the canal, cause problems by out-competing native vegetation and smothering the open water habitat. The most serious threats come from *Hydrocotyle ranunculoides* floating pennywort and *Crassula helmsii* New Zealand stonecrop. *Heracleum mantegazzianum* giant hogweed, *Fallopia japonica* Japanese knotweed and *Impatiens glandulifera* Himalayan balsam are other invasive non-natives.

- Alien species such as *Mustela vison* American mink and *Pacifastacus leniusculus* signal crayfish pose threats to the native wildlife within our canals.

4. Current Action

4.1 Local protection

It should be noted that since British Waterways do not own the Droitwich Canal, the British Waterways Act does not apply until 2009/10, when the canal becomes the responsibility of British Waterways.

All three canals in Worcestershire as well as the Tardebigge Reservoir, created to maintain canal levels, are designated as Special Wildlife Sites. Bittell Reservoir, which supplies the Worcester and Birmingham Canal, is a SSSI.

4.2 Habitat management and programmes of action

- Droitwich Canal fell into disrepair after it was abandoned in 1939. Some sections have been blocked or lost to development but the majority remains intact and since the 1960s the canal has been subject to various restoration efforts. The Droitwich Canals Trust was formed in 1973 and since that time they have been working to gradually reopen both the

towpaths and the canal sections themselves to the public and recreational boat traffic. The Droitwich Canals Restoration Partnership, with British Waterways as lead partner, has now secured almost £10 million for the completion of the restoration project by 2008, creating a 22-mile navigable river and canal route called the Mid Worcestershire Ring.

- Soft bank protection is installed and monitored on some canal sections as an alternative to steel piling to combat soil erosion and maintain riparian emergent vegetation ideal for water voles. British Waterways always aim at using alternatives to hard bank protection where it does not reduce the safety, water management or heritage value of the canal. To date this has included the use of coir rolls and geotextiles on various stretches of the Staffordshire and Worcestershire, Trent and Mersey, Birmingham and Fazeley and Coventry Canals. For example, 25m of coir matting have recently been installed on the canal at Tardebigge Reservoir that will shortly be planted with native vegetation.

- British Waterways intends to investigate current towpath cutting regimes and alter these where biodiversity benefits can be gained.

- British Waterways produced an environmental code of practice (ECP) in 1996 that is reviewed annually, designed to instigate more sympathetic operating procedures and to protect and enhance wildlife habitat on canals. The current ECP applies to all of British Waterways works with the aim of protecting the environment and heritage. This is likely to be replaced in the near future by an Environmental Management System.

- British Waterways plans to produce a Conservation Plan for the Staffordshire and Worcestershire Canal to provide a management programme for the canal and its key species and habitats. An integrated programme of tree management on this canal by British Waterways has begun and, with the support of Worcestershire Wildlife Trust, otter holts were built in winter 1998/99.

4.3 Survey, research and monitoring

- A number of botanical and habitat surveys have been carried out by British Waterways although coverage is incomplete. British Waterways is committed to ensuring that the monitoring of key BAP species is carried out at suitable intervals.

5. Associated Plans

Reedbeds, Rivers and Streams, Otter, Water vole, Great Crested Newt.

6. Vision Statement

To maintain and enhance the natural environment of the canal corridors in Worcestershire and their associated wetland habitat, maximising their potential for acting as green corridors for the movement of wildlife across the county.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Achieve condition	Programme of mink control completed along Worcester and Birmingham Canal	0	48km of canal	2010
Achieve condition	Habitat creation / restoration scheme completed to link up currently fragmented water vole colonies on Worcester and Birmingham Canal through Bromsgrove District between Stoke Works and Bittell Reservoirs	0	15km of canal	2012

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC CAN AP 01	**1.1**	Secure support from landowners and begin an annual programme of mink control along the Worcester and Birmingham Canal.	Worcester and Birmingham Canal	2010	BW	
WRC CAN CA 01	**2.11**	Ensure lock keepers receive information on the importance of lock gates and canal walls to biodiversity and advice on ensuring the floral interest of these is protected and maintained.	Worcestershire	2017	BW	WWT
WRC CAN CP 01	**3.7**	Produce a leaflet for distribution through canal boat hire businesses and other relevant leisure and tourism outlets to raise awareness of canal biodiversity in worcestershire amongst tourists and boat hire operators	Worcestershire	2009	BW	WWT WCC
WRC CAN HC 01	**7.6**	Create or restore habitat and improve bank side management in order to link up fragmented water vole colonies.	Worcester and Birmingham canal	2012	BW	WWT
WRC CAN ID 01	**2.11**	Carry out a survey of canalside veteran trees and provide management advice and guidance as necessary to owners.	Worcestershire	2009	WR	
WRC CAN SU 01	**13.2**	Two water vole surveys to be carried out at sites with both recent and historical records.	Worcester and Birmingham Canal	2015	BW	WWT
WRC CAN SU 02	**13.2**	Crayfish survey to be carried out at key lock	Staffordshire and	2010	BW	WWT

		gates to determine species.	Worcestershire Canal			

BW – British Waterways
WCC – Worcestershire County Council
WWT – Worcestershire Wildlife Trust
WDC – Wychavon District Council
WR – Worcestershire Recorders

Ponds and Lakes Habitat Action Plan

1. Introduction

The following five UK BAP habitats are of relevance to this plan: Aquifer Fed Naturally Fluctuating Water Bodies; Mesotrophic Lakes; Oligotrophic and Dystrophic Lakes; Eutrophic Standing Waters; Ponds.

2. Current Status

2.1 Description of habitat

The conservation value of ponds and lakes lies in both the role they play in the landscape and cultural heritage of the British Isles and in the high levels of biodiversity a functioning freshwater ecosystem can contain. They are a significant feature in terms of local distinctiveness and in many areas form a parish or village focal point. The value of ponds to wildlife is immense and it has been suggested that a pond supports a greater diversity of species per cubic metre than any other habitat in Britain. A huge variety of invertebrate, plant, amphibian and bird life is dependent on still, enclosed water bodies for part or all of their life cycle. In addition a number of mammal species depend on or use still open water bodies.

The UK's 14,000 lakes can be divided into three categories:

- Oligotrophic: usually found on old, hard rocks in upland areas, with naturally very low nutrient levels and supporting only very limited biological production.
- Mesotrophic: usually found on softer, more easily eroded rock with naturally low nutrient levels supporting a wide range of plant and animal species including many that are nationally scare or rare.
- Eutrophic: hard calcareous water in lowland areas, with naturally high nutrient levels supporting prolific and often diverse aquatic plants.

Worcestershire has a variety of pond and lake features, ranging from areas with a noticeably high density of small ponds to historically significant medieval fish pools and moats. From a regional perspective the presence of this unique "pondscape" sets Worcestershire apart from its Midland neighbours, with an average pond density in the county of 2.9 per 1km², rising to between 5-10 per 1km² in 'core pondscape' areas. Pondscapes are vital in the meta-population ecology of species such as *Triturus cristatus* great crested newt. The typical Worcestershire heavy clay soils and network of watercourses are fundamental to this patchwork of ponds, which act as a network linking freshwater bodies and their associated marginal and terrestrial habitats together into a continuous mosaic across the countryside. Ponds can provide an important educational asset and contribute to the distinctive character of the landscape. The number and variety of ponds in the county also reflects the changing face of the countryside through time.

The urban landscape can also make an important contribution in supporting pond habitats. Ponds are a prominent ornamental feature in many gardens and parks and even the smallest can support a wealth of wildlife if managed appropriately, acting as a reservoir for the expansion and movement of species throughout our

urban areas. With careful town planning existing ponds and lakes can be incorporated into development in a way that not only makes the area a more attractive place for residents and workers but also ensures that habitat connectivity is maintained across the townscape. A good example of this in Worcestershire is the New Town of Redditch, whose expansion during the 1960s was designed to incorporate many existing semi-natural habitat features including around 130 ponds: this urban pondscape today supports good populations of great crested newts.

2.2 Distribution and extent

There are very few large natural open water bodies in Worcestershire. There is an extant ox bow lake on the River Teme near Leigh and an acid pool at Hartlebury Common SSSI on peat dating back 7000 years. A Phase 1 survey of the county in 1978 analysed 417 pools of 0.25 ha and above and at that time there were 13 water bodies over 5 ha and 2 over 20 ha.

A study in 1982 on behalf of Worcestershire Wildlife Trust estimated the loss of smaller field and garden ponds using current and historic OS maps and survey data of approximately 1500 ponds. Between 1920 and 1972 30% of Worcestershire ponds were lost through intensive agricultural practices, urban development or general lack of management and by 1982 this figure had risen to 49%. Work in 1982 by John Day (a summary of which can be found in Green and Westwood, 1991) estimated that there were around 5000 ponds remaining in the county. In 1998 a student project, supervised by Worcestershire County Council, surveyed a sample area of 1km² north of Redditch and compared results of the ground survey with OS maps. The project identified that around 45% of all ponds shown on the maps had been destroyed.

Artificial open water habitat has been created for a variety of reasons:

Mineral extraction

- Clay extraction has occurred on a small scale in the past along the Severn Valley and a series of disused pits have developed into valuable sites such as Mucky Meadows, Shrawley and Grimley Brick Pits and Northwick Marshes SSSI. Baggeridge Brick PLC is currently extracting clay on a large scale near Hartlebury. A site at New House Farm has the potential to create a large lake once extraction has finished in approximately 20 years time.
- Hard rock extraction has created a number of pools as in the Gullet Quarry on the Malvern Hills and Rodge Hill Quarry north of Martley.
- Sand and gravel extraction has resulted in pools at Upton Warren Holt, Grimley, Beckford, Lower Moor, Retreat Farm and Kemerton. Others are being dug along the River Severn at Ripple and Clifton and these will create some of the largest pools in the county. Sand extraction has resulted in Larford Pool near Stourport.
- Historically, the extraction of lime rich marl for application to arable fields was done by farmers on an individual basis and resulted in the digging of small pits in the corner of many fields. These have subsequently developed into a valuable network of field ponds, in many areas forming the core of the pondscape described above.
- Most mineral workings will create ephemeral bodies such as silt ponds, some of which often last a decade.

Maintenance of canal levels such as Upper and Lower Bittell and Tardebigge Reservoirs.

Landscaping purposes such as Pirton Pool, Croome River and Westwood Great Pool.

Reducing flood risk within urban areas by providing or increasing storage capacity for floodwater and run-off.

Nature conservation purposes such as Hill Court Farm reservoir, created in 2005 by Worcestershire Wildlife Trust as part of a long-term project to re-wet part of the Longdon and Eldersfield marshes.

Brine pumping and salt extraction has resulted in subsidence in the Bromsgrove / Droitwich area and the appearance of open water habitats at Upton Warren and Oakley Pools. These pools have developed with a surrounding saltmarsh community and such habitats are found in only a few sites in Britain.

Millponds, cart ponds and field ponds for the watering of stock may survive in farmyards or the wider farmed landscape.

Water bodies created for recreational fishing or other amenity use.

Ponds as ornamental features in private gardens and public parks can be significant breeding areas for *Rana temporaria* common frog, great crested newt and other amphibians.

Of the sites identified as Preferred Areas for Extraction in the Minerals Local Plan (but not yet developed) Grimley, Ryall North and Strensham are considered to have potential to include open water areas as part of their overall restoration.

2.3 Legislation

Ponds and lakes fall under the Water Framework Directive legislation that requires all inland and coastal waters within each river basin district to reach at least good status by 2015 through the establishment of environmental objectives and ecological targets for surface waters.

Ponds and lakes designated as SSSIs receive protection under the Wildlife and Countryside Act 1981 (and subsequent amendments). National protection under the Wildlife and Countryside Act 1981 is also afforded to *Alisma gramineum* ribbon-leaved water plantain, found at Westwood Great Pool SSSI.

International protection under the European Habitats Directive is given to one pool species, the great crested newt, which is widespread in Worcestershire.

Modern mineral planning permissions have comprehensive conditions attached to them relating to the restoration of the land and schemes often contain detailed proposals for nature conservation and other end uses that incorporate open water features. All mineral planning permissions will be reviewed every 15 years and those granted within the county will be reviewed and updated by Worcestershire County Council (under the provisions of the Environment Act 1995) to ensure that modern standards are met.

2.4 Summary of important sites

The north east of the county is characterised by high densities of small pools (often between 5 and 10 per square km). These landscapes are described as 'core pondscapes' and examples include the countryside surrounding Hanbury, in particular across Hanbury Park, where old brick and marl pits have developed into pools of some importance for great crested newt populations. The medieval fish pools and moated sites at Feckenham are also significant.

Lyppard Grange Ponds SAC / SSSI is located within the Warndon Villages development on the outskirts of Worcester. It consists of several former field ponds with surrounding associated terrestrial habitat that now serves as public open space within the housing development.

The two ponds are eutrophic with well-established submergent vegetation and the site supports one of the largest known breeding colonies of great crested newts in the country. A substantial population of *Triturus vulgaris* smooth newt also exists on the site, *Natrix natrix* grass snake has been recorded, and the ponds also support a rich and diverse variety of aquatic invertebrates including the nationally rare *Hydrochus elongatus,* a scavenger water beetle.

Bittell Reservoirs SSSI lie in the Upper Arrow Valley of north Worcestershire. This series of three reservoirs form the largest area of open water in the county and represent one of the most important sites in the West Midlands for passage and wintering waders as well as other waterfowl, with over 200 species recorded. Breeding birds include *Podiceps cristatus* great crested grebe and *Charadrius dubius* little ringed plover.

The marginal communities present include a rare silt shoreline community in the draw down zone of Upper Bittell where the nationally rare *Eleocharis uniglumis* slender spike rush and *Limosella aquatica* mudwort are abundant. The open water community is also very diverse with *Potamogeton berchtoldii* small pondweed, *Potamogeton obtusifolius* blunt-leaved pondweed and *Zannichellia palustris* horned pondweed, all of which are scarce in Worcestershire. The invertebrate fauna includes 5 species of dragonfly and the rare *Lymnaea glabra* mud pond snail.

Westwood Great Pool SSSI is a man-made lake originally constructed as a major landscape feature. The site represents one of the largest areas of open water in Worcestershire and is important for both its plant and bird communities. Amongst the aquatic flora present are the *Nuphar lutea* yellow water lily and two national rarities, *Elatine hydropiper* eight-stamened waterwort and ribbon-leaved water plantain. The latter was discovered at Westwood Great Pool in 1920 and this record was the first for Britain: it is still known from only three other sites in the country.

The northern and eastern margins of the Lake support extensive beds of *Typha latifolia* common reedmace and *Schoenoplectus lacustris* bulrush, which support the largest colony of *Acrocephalus scirpaceus* reed warbler in the county. Other breeding bird species include great crested grebe, *Aythya fuligula* tufted duck and *Aythya ferina* pochard. This is also one of the most important sites for over-wintering waterfowl in Worcestershire.

Upton Warren SSSI consists of a series of shallow pools: two that formed as a result of subsidence associated with salt extraction and the third a flooded gravel pit. The southern pools are significantly saline due to ongoing brine seepage, creating a habitat unique in Worcestershire. The River Salwarpe and the Hen Brook also run through the site. The principal importance of Upton Warren is in the ornithological interest with the pools providing an important habitat for wintering and passage waterfowl and wader species. The bare mud and saltmarsh of the southern pools are particularly important in this respect. Over 60 breeding bird species have been recorded including *Cygnus olor* mute swan, tufted duck, *Oxyura jamaicensis* ruddy duck, great crested grebe, *Tachybaptus ruficollis* little grebe, *Recurvirostra avosetta* avocet and *Sterna hirundo* common tern.

The site also has considerable botanical importance. The halophytic (salt loving) plants round the southern pools represent one of the few inland areas of saline vegetation in Britain. These include such plants as *Spergularia marina* sea spurrey and *Puccinellia distans* reflexed saltmarsh-grass, species more usually found at the coast. The fen and wet grassland areas support plants including *Dactylorhiza fuchsii* common spotted orchid and *D. praetermissa* southern marsh orchid together with their hybrids. *Mentha suaveolens* apple mint is also a feature of these areas.

Hewell Park Lake SSSI is a shallow artificial lake surrounded by ornamental woodland lying in the grounds of HMP Hewell Grange. The lake margin has extensive areas of reed, which support one of the largest colonies of reed warbler in Worcestershire and the locally distributed *Acorus calamus* sweet flag and *Lysimachia vulgaris* yellow loosestrife. The lake and its margins have considerable ornithological importance in a local context, providing breeding habitats for waterfowl including great crested grebe. The lake is also interesting for its amphibians and reptiles.

Oakley Pool SSSI consists of a pool surrounded by reedswamp, fen and grassland. The pool appears to have been formed by subsidence following underground brine extraction and is thought to be still extending due to continued subsidence. Besides common reedmace the marginal vegetation includes *Filipendula purpurea* meadow-sweet, *Carex riparia* and *C. acutiformis* great and lesser pond sedge and *Epilobium hirsutum* great willow-herb. The submerged plants include the locally uncommon *Ceratophyllum demersum* hornwort.

The secluded nature of the area provides a valuable breeding site for a number of birds including reed warbler, which has a large breeding colony in the reedswamp. The margins of the pool also support breeding little grebe, tufted duck, pochard and ruddy duck. *Locustella naevia* grasshopper warbler breeds in the tall vegetation at the north end of the pool. The site is regularly used for bird ringing and other ornithological research, which adds to its scientific importance.

3. Current factors affecting the habitat

Pollution and waste disposal

The authorised and unauthorised tipping of inert wastes is a particular factor in the loss of many ponds on agricultural land, in particular old marl pits. Since the implementation of the Landfill Tax there is evidence that some inert waste is not being disposed of at licensed landfill sites as a means of tax avoidance. Ponds

can also be damaged by fly-tipping. Some pools were created deliberately to take waste such as the British Sugar settling pools at Wilden Marsh that will eventually be filled in. Other old quarry workings with ponds in them have been filled with rubbish or are restored to non-conservation end uses such as agricultural land.

Small farm ponds are vulnerable to eutrophication and pollution from agricultural runoff and drainage particularly if surrounded by intensively farmed land with no buffer zone. Urban runoff affects some open water habitats: oils, metals, grit and solids or foul water from connections such as washing machine discharges may contaminate ponds. Salt from road runoff is particularly toxic to amphibians.

Development
Expanding urban areas and roads results in the fragmentation and isolation of pond habitats or the outright destruction of ponds. Retaining existing water bodies within new developments has become more accepted in recent years but the importance of retaining sufficient surrounding terrestrial habitat is often ignored or forgotten, as are the wider hydrological needs of the pond itself.

Development usually leads to the creation of large impermeable surfaces draining into piped drainage systems. Natural infiltration into the ground is inhibited with a corresponding reduction in ground and surface water recharge. Even when pools are incorporated into development design to balance or attenuate surface water runoff there is often resistance to the creation of open water features. Instead concrete pools, underwater tanks or enlarged pipes are often built due to maintenance liability, pollution, fears over safety and adverse public reaction.

Neglect and or natural succession
Ponds not actively managed are vulnerable to silting up, becoming overgrown and drying out. Management of many ponds in advanced stages of succession has tended towards indiscriminate clearance of all vegetation, which can do significant damage to the wildlife value of the pond. Most ponds have never been subject to a strategic evaluation or management plan. The removal of large volumes of silt from a pond in an attempt to restore it can create its own problems in disposing of the dredged material.

Alien or damaging species
A number of alien fauna and flora cause problems for pools. *Crassula helmsii* New Zealand pigmyweed occurs at a number of pools in Worcestershire including at Monkwood and Trench Wood. This plant thrives at the expense of native flora and can form near monocultures. *Impatiens glandulifera* Himalayan balsam also poses a very real threat to many wetland habitats within the county. Large numbers of introduced waterfowl can cause a loss of aquatic vegetation through grazing and/or nutrient enrichment via faeces. This is exacerbated where birds are fed by the public. *Branta canadensis* Canada geese are a problem in many areas, for example on Arrow Valley Lake.

Recreational and amenity pressures
Recreational uses of a water body can conflict with conservation interests. At Westwood Great Pool water-skiing causes disturbance to wildlife and the wash from the speedboat damages marginal swamp vegetation. Upper Bittell Reservoir and one of the lakes at Upton Warren are used for sailing. The

intensive stocking of fish reduces the conservation value of a water body to other species and inappropriate introduction of fish can adversely affect sensitive amphibian populations. Fishing can also cause disturbance through the creation and use of access and fishing pegs. Litter including discarded lines and hooks can be a problem.

Policy and legislation

Any pool holding more than 25,000m³ above original ground level needs to be maintained in accordance with the Reservoirs Act 1975, including an annual report from a qualified structural engineer that it is safe. At least one, Stanford Pool by the River Teme, has been totally drained because the owner could not afford the licence. Hurcott and Podmore Pools SSSI had the water level dropped by about 1.5m for the same reason, which has caused a considerable decline in its wildlife value.

Planning permission is not always obtained for the construction of pools, or in the case of small garden ponds permission is not needed, and the provision of conservation advice rarely occurs. This may result in the creation of an ornamental pond that has little or no wildlife value.

Abstraction

Abstraction from ground and surface waters can adversely affect open water habitat. Several SSSIs in Worcestershire with an open water component have been identified by Natural England and the Environment Agency as vulnerable and suffering due to over-abstraction, including Hewell Park Lake and Hurcott and Podmore Pools. The Triassic sandstone aquifers in the north of the county are described as 'grossly over-abstracted' by the Environment Agency. Asset Management Plans have been prepared for priority sites by the Environment Agency to improve water quality and overall hydrological integrity.

4. Current Action

4.1 Local protection

Bittell Reservoirs, Hewell Park Lake, Hurcott and Podmore Pools, Oakley Pool, Upton Warren Pools, British Camp Reservoir, Shrawley Wood New Pool and Westwood Great Pool are all designated as SSSIs. Other SSSIs that have aquatic interest include Castlemorton Common, Monkwood Green and Ipsley Alders Marsh. There are 62 county Special Wildlife Sites that contain open water as their primary habitat, although many more contain smaller water bodies as part of a habitat mosaic.

4.2 Habitat management and programmes of action

The **Water Framework Directive** promotes a new approach to water management through river basin planning. The Directive applies to all surface freshwater bodies (including lakes, streams and rivers), groundwaters, groundwater dependant ecosystems, estuaries and coastal waters out to one mile from low-water. It will help to improve and protect inland and coastal waters, drive wiser, sustainable use of water as a natural resource and create better habitats for wildlife that lives in and around water. There is a requirement for relevant inland and coastal waters to achieve 'good status' by 2015. Worcestershire falls within the Severn River Basin District for which a management plan is currently in preparation.

Pond Conservation is the UK's leading centre for information and practical advice on the conservation of ponds. They carry out a programme of research, policy development, advice provision and practical work on rivers, lakes, ponds, canals and drainage ditch systems.

The Environment Agency, Natural England, Pond Conservation and others have produced a wide range of leaflets on pond management for wildlife. Information on controlling *Crassula helmsii* has been produced by the Institute of Freshwater Ecology and Natural England. FWAG can advise on the management of water bodies on farms.

Environmental Stewardship payments are available to farmers via HLS for the maintenance of ponds of high wildlife value and the maintenance, restoration and creation of associated wetland habitats such as reedbed and fen, and capital payments for pond creation and restoration. ELS options are available for buffering in-field ponds.

Planning and Development Control provides opportunities for the creation and management of water bodies. Minerals Policy Guidance Note 7 (MPG7) 'The Reclamation of Mineral Workings' includes advice on the reclamation of old mineral workings to open water and wetland areas for amenity and conservation end uses. Regulation 37 of the Conservation (Natural Habitats, &c.) Regulations 1994 states that local plan policies in respect of the conservation of the natural beauty and amenity of the land should include the management of 'stepping stone' landscape features such as ponds, which are 'essential for the migration, dispersal and genetic exchange of species'. The Warndon Villages development in Worcester has been a success in pond retention and management post development through section 106 agreements, which saw 24 ponds restored. Other opportunities could arise from:

- The increased use of Sustainable Urban Drainage Systems (SUDS) in connection with new highway schemes and changes in techniques for the drainage of road surfaces.
- The increased use of reedbed / wetland systems for treating grey water from both agriculture and commercial / industrial developments.
- Future mineral development in the county outlined in the proposed Minerals Core Strategy.

Worcestershire Wildlife Trust manages a number of open water sites including Upton Warren Pools and Broadway Gravel Pit. A small reservoir has been newly constructed at Hill Court Farm nature reserve. There are also isolated ponds on several reserves including Ipsley Alders, Feckenham Wylde Moor, Monkwood, Chaddesley Wood, Beaconwood and the Winsel, Broadmoor Wood, Spinneyfields, Hunthouse Wood, Grovely Dingle, Wilden Marsh and Pipershill Common.

Hewell Park Lake SSSI will undergo management work as part of the ongoing effort of both the Prison Service and the Hereford and Worcester Gardens Trust to restore some of the original landscape features of the site. One of the key restoration projects due to take place is to restore (re-open) the Repton-designed views across the lake which will involve the removal of *Salix* sp. willow and *Alnus glutinosa* alder scrub, *Rhodendron ponticum* rhododendron and some standard trees on the lake fringes. This will have the added effect of removing scrub

encroachment from the reedbed. Hewell Park Lake has suffered in the past from over-abstraction of groundwater in the area and HMPS are working with Natural England and Severn Trent to ensure water levels are maintained.

A key challenge for HMPS in managing the site with regards to its biodiversity value is to integrate the demands of the various land-use pressures within the park, bearing in mind its modern-day function as an open prison and as a prison farm, with the aspirations of interested conservation bodies in restoring the historic features of the gardens and parkland, as well as fulfilling their legal obligations with regards to the SSSI.

The **Aqua Vitae 21** project was a two year pilot initiative begun in 1998 by Worcestershire County Council, plus other partners including Severn Trent Water, the Environment Agency, The Countryside Agency, Worcestershire Wildlife Trust, BTCV and FWAG, to tackle and arrest the decline of locally and regionally important pond features. The primary aim of the project was to select, survey and carry out restoration works on 21 examples of Worcestershire ponds. The sites chosen were exemplar county sites of ecological, historical and cultural importance. The project report was the first document of its kind to offer guidance on preserving ponds and was supplied to local authorities and communities nationwide.

4.3 Survey, research and monitoring

The **National Pond Monitoring Network** was established as a partnership project, funded by the Environment Agency and Pond Conservation, with the support of UK government agencies and NGOs. It brings together as partners all organisations and individuals with an interest in recording or using data on ponds and pond species, stimulating survey activity and supporting people planning surveys by providing standard survey methods, training and advice. The Network is developing the National Ponds Database to collate datasets from various sources and to make the data publicly available through the project website.

In 1986 the **National Amphibian Survey** was launched and this stimulated a great deal of work on the distribution and abundance of amphibians, in particular great crested newts, in Worcestershire. In 1987 an amphibian survey was conducted of the Warndon Parish in Worcester City of which 410ha of land had been scheduled for development. The 45 ponds present within this area continued to be closely studied over the 10-year period of the development and Great Crested Newts were recorded from 25 (Watson, 2001). The ponds at Lyppard Grange, with 187 individual adult crested newts recorded in one evening, is still the best recorded site in Worcestershire. From the mid 1990s onwards attention was focused on other parts of the county to find out if this high rate of occurrence was repeated elsewhere. In total, between 1987 and 2000, 387 Worcestershire ponds were surveyed at least once for amphibians. A total of 335 of those ponds contained one or more species of amphibians, representing 86% of the total. 190 of those ponds surveyed contained Great Crested Newts: a 49% occurrence rate for the species.

The **National Amphibian and Reptile Recording Scheme** (NARRS) is a national wildlife monitoring project to measure trends in the conservation status of all UK species of amphibian and reptile. NARRS is being developed by The Herpetological Conservation Trust (HCT) in partnership with other organisations.

It will provide information on the status of amphibians and reptiles in Britain, but will also raise awareness and appreciation of these species and encourage people to get involved in recording and conservation. In 2007 NARRS launched two new national surveys for amphibians and reptiles, asking volunteers to adopt and survey a sample 1km square. Ponds will form an important part of the survey work.

Worcestershire Wildlife Trust carried out a botanical survey in 2002 of 42 standing water bodies in the county over 1ha in size. Surveys involved the assessment and mapping of both bank-side and aquatic vegetation. Samples of the aquatic invertebrates were also collected and sightings or evidence of other species recorded including birdlife, mammals and dragonflies. Many of the pools surveyed were found to have deteriorated through eutrophication and inappropriate management/lack of management.

5. Associated Plans

Rivers and Streams, Reedbeds, Fen and Marsh, Wet Grassland, Canals, Otter, Water Vole, Great Crested Newt, White-clawed Crayfish.

6. Vision Statement

All ponds and lakes in Worcestershire that fall under Water Framework Directive Criteria to achieve the ecological quality standards set, achieved through the effective implementation of the Severn River Basin District Management Plan.

Worcestershire will continue to be a county held in national regard for the significance of its great crested newt populations and the pondscape habitat mosaic across our countryside is valued and enhanced whenever opportunity allows.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Maintain extent	Maintain extent of 22 lakes	22	22	2017
Restoration	Restore 36 lakes or pond complexes	0	36	2017
Expansion	Create 18 new lakes or pond complexes	22	40	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC PAL FR 01	**4.11**	Secure / allocate funding for the restoration of 36 lakes or pond complexes (provisionally 6 per district).	Worcestershire	2017	All District Councils	WCC

References and further information

Green, G H and Westwood, B (1991). *The Nature of Worcestershire: The Wildlife and Ecology of the Old County of Worcestershire.* Barracuda.

Watson, W (2001). *The Status and Distribution of Great Crested Newts in Worcestershire 2000*. Worcestershire Record Issue 11.

Worcestershire County Council Countryside Service (2000). *Aqua Vitae 21: A Best Practice Guide to Pond Restoration.* Worcestershire County Council.

www.narrs.org.uk

www.herpconstrust.org.uk

www.brookes.ac.uk/pondaction/index.html

www.pondnetwork.org.uk

Rivers and Streams Habitat Action Plan

1. Introduction

This plans concerns all running water habitats (rivers and streams) within the County. It does not include canals, which have their own Action Plan within this BAP. Rivers are a priority UK BAP habitat.

2. Current Status

2.1 Description of habitat

Rivers and streams are a vital and integral part of the natural and semi-natural environment, providing wildlife corridors through both urban and rural areas (often intensively managed). They provide water for many wetland wildlife sites as well as providing a unique range of habitats for a diverse array of flora and fauna. These associated habitat features are often species rich (or have been in the past prior to agricultural intensification).

Rivers and streams became degraded as a result of pollution from industrialisation, from land drainage and navigation work and from the ongoing impacts of urban encroachment and intensive agriculture. The unsustainable abstraction of groundwater has caused many problems in the North Worcestershire area – the Worcestershire Wildlife Trust drew attention to this problem in the late 1990's with their specific study on the brooks around Kidderminster.

Water quality in our rivers and streams has been steadily improving in recent years: mainly as a result of modern regulations from EU Directives resulting in the better regulation of discharges into rivers and streams. However, diffuse pollution continues to be a serious problem in many rivers, as does the legacy of land drainage and flood defence works, such as dredging, straightening and re-sectioning, which cannot easily be rectified. Ground and surface water abstractions are regulated through abstraction licences in order to manage water resources in a more sustainable manner.

Despite human influence the rivers and streams of Worcestershire support a wide range of native species including both Salmonid and Coarse fisheries, *Lutra lutra* otter, *Arvicola terrestris* water vole, *Austropotamobius pallipes* white clawed crayfish, *Gomphus* vulgatissimus common club-tail dragonfly and *Pseudanodonta complanata* depressed river mussel, not to mention the vast array of bird species associated with the rivers and their banksides.

Rivers and streams provide an essential wildlife corridor link between fragmented habitats in intensively farmed rural areas and urban areas alike. The natural flooding of rivers and streams is an essential requirement for the majority of our floodplain wetlands. However, due to human interference with rivers to drain land, reduce the risk of flooding to properties and land, to provide navigation and to allow the construction of development and roads the majority of the rivers and streams in Worcestershire have been modified to a greater or lesser extent. Very few of our watercourses can be considered truly natural. This modification has often greatly reduced the biodiversity value of these watercourses. Many of our

rivers and streams were straightened, deepened and re-sectioned to allow for agricultural intensification post-World War Two until the early 1990's.

The best watercourses for biodiversity are those that have been least affected by human modification and exhibit the most natural features typical of the river type. Rivers and streams that exhibit the greatest diversity of flow patterns and channel features (riffles, pools, glides, side bars, coarse woody debris, islands, meanders, erosion, etc.) provide important habitat niches for wildlife.

2.2 Distribution and extent

Rivers and streams flow throughout the urban and rural areas of Worcestershire providing an arterial network for wildlife that extends into the neighbouring Counties. The majority of rivers and streams in Worcestershire ultimately flow into the River Severn, with the exception of a few small streams in the north east that flow into the headwaters of the River Blythe in the Trent Catchment, and some small streams which flow into the Wye Catchment. The River Severn flows through the middle of Worcestershire with its major tributaries being the Avon, Teme and Stour.

The majority of the rivers in Worcestershire are typical of lowland rivers, meandering through large floodplains. These rivers have been significantly modified and their character has been reduced through the construction of weirs, flood defences, dredging, straightening and impounding, all resulting in a reduction in structural diversity. These modifications have caused a reduction in fish movement, loss or inaccessibility of spawning gravel and a reduction in the value of aquatic flora. There are many smaller rivers, brooks and streams that flow through valleys and as a consequence have smaller, but still important, floodplains. These smaller watercourses tend to have retained a more natural character, although many have been modified to a certain extent.

2.3 Legislation

- The Environment Agency, the Lower Severn Drainage Board, Local Authorities and Severn Trent Water have a statutory duty to further conservation where consistent with the purposes of enactments relating to their functions (as set out in the Water Resources Act 1991, Land Drainage Act 1991 and the Environment Act 1995). The Environment Agency has a statutory duty for pollution control, flood defence and water abstractions.

- All rivers and streams fall within the remit of the Water Framework Directive. The Directive was transposed into UK law in 2003 and its broad objectives are to:
  - Improve inland and coastal waters and protect them, especially from diffuse pollution in urban and rural areas, through better land management
  - Drive wiser, sustainable use of water as a natural resource
  - Create better habitats for wildlife that lives in and around water
  - Create a better quality of life for everyone

  (Source: Environment Agency Water Framework Directive Website, 2007)

  The WFD legislation requires all watercourses to achieve good ecological status (or good ecological potential for heavily modified watercourses) by

2015. Targets and objectives for the Severn River Basin District, which covers the county of Worcestershire, will be set by 2009. As a result it is proposed that this Rivers and Streams Habitat Action Plan be revised in 2009 to reflect and complement the Water Framework Directive targets.

- The Natural Environment and Rural Communities (NERC) Act 2006 amends the flood defence byelaw-making powers of the Environment Agency, Local Authorities and Internal Drainage Boards to require them to take nature conservation into account when determining consent for flood defence works.

- The Wildlife and Countryside Act (1981) as amended, Habitats Directive (2000) and Countryside and Rights of Way Act (2000) contain legislation that protects specific species of flora and fauna to varying degrees and also allows for the protection of natural habitats through Designations. This protection of species and habitats has a direct impact on rivers and streams throughout the County. The legislation also places an onus on Competent Authorities to assess their work and any consents and authorisations that may have an effect upon SPA's, SAC's and SSSI's.

3. Current Factors affecting the Habitat

- **Pollution**
  Agriculture, industry and highway runoff has caused long-term pollution to rivers and streams. In addition sewage treatment companies have historically discharged poorly treated effluent into watercourses. Modern regulations and enforcement methods have greatly reduced effluent discharges to acceptable levels and agricultural activities are also starting to be tackled in a more effective manner.

- **Flood Defence and Land Drainage Works**
  Historic and ongoing flood defence and land drainage work has caused the irrevocable destruction of the natural form of the majority of the rivers and streams in Worcestershire. The dredging, straightening, widening and canalising of many of our rivers have resulted in a dramatic loss of associated flora and fauna. Many important features such as riffles and pools have been lost and the rivers and floodplains no longer act as self-functioning ecosystems.

- **Development Within the Floodplain**
  There has been widespread and inappropriate development in the floodplain in recent decades. This has lead to the loss of many wetland habitats, including the loss of open water features. One of the most worrying aspects of this development is that it will be very difficult, if not impossible, to restore naturally functioning rivers in many places in the future because of the potential for increasing the flood risk to inappropriately located buildings.

- **Agricultural Land Use**
  Changes in farming practices since the Second World War have resulted in the large-scale intensification of our agricultural industry. Modern techniques have allowed previously unproductive land to be turned over to arable production and once uneconomical crops are now economical. This intensification has resulted in an increase in the use of chemical inputs and

the large scale draining of land. This has lead to increased rates of chemical runoff, soil erosion and increased surface water runoff, leading in some cases to direct flooding.

- **Water Abstraction**
  Unsustainable abstraction of ground and surface waters for domestic, industrial and agricultural use has resulted in a reduction of flows in some of our rivers and streams (e.g. the Sherwood Sandstones) and in some severe cases has resulted in low flow levels in some streams, even resulting in seasonally dry channels. Droughts, possibly as a result of the onset of climate change, appear to be on the increase and this places a higher demand on our limited water supply. Water companies are preparing for this by producing Environmental Reports which will help to justify the need for Drought Permits should they need them in the future. The Environment Agency's Catchment Abstraction Management Strategy (CAMS) process, current abstraction licensing and Restoring Sustainable Abstraction programme are tackling historic and ongoing unsustainable abstraction so that our water resources are managed in a sustainable manner that does not detrimentally impact upon biodiversity.

- **Invasive plants and animals**
  A particular threat to the wetland environment is that of invasive species as they out-compete and ultimately eradicate our native flora and fauna from their particular niches. Species such as *Pacifastacus leniusculus* signal crayfish, *Mustela vison* mink, *Sander lucioperca* zander, *Fallopia japonica* Japanese knotweed and *Impatiens glanulifera* Himalayan balsam are all causing considerable harm to riverine habitats and species and are particularly difficult to control.

- **Inappropriate River Management**
  Culverting watercourses, retaining them in engineered walls (such as concrete, sheet piling or gabion baskets), over grazing, cattle poaching and inappropriate planting along riverbanks has lead to a reduction in habitat diversity along rivers and streams.

- **Recreational Activities**
  Many recreational activities such as angling, off-roading, walking and boating can have a significant destructive impact if not properly regulated.

- **Modification for Boat traffic**
  The entire lengths of the Rivers Severn and Avon through Worcestershire have been modified for boat traffic. Artificial weirs and the widening, dredging and straightening of the river has resulted in a considerable loss of habitat diversity. A significant length of the River Severn has been reinforced using rock armour to allow commercial shipping up as far as Worcester. This has resulted in the near total loss of aquatic vegetation and the consequential reduction in aquatic fauna. Commercial shipping ceased along this part of the River Severn soon after the river engineering works were completed. The rivers are now used almost entirely by pleasure boats. The transport of sand and gravel along the Severn from Saxon's Lode has recently commenced, providing a more sustainable method of transportation.

- **Lack of Awareness/Information**
  A significant amount of habitat destruction has been caused not by deliberate destruction but by well meaning, but ill informed organisations or individuals. For example, for many years fallen trees or exposed berms were removed to allow water to flow more freely down the rivers. However it has only relatively recently been appreciated the enormous biodiversity value that these features represent in the riverine environment.

4. Current Action

4.1 Local Protection

- The River Teme has been designated a SSSI for its associated flora and fauna. A small part of the Old River Severn SSSI is in Worcestershire at Upper Lode. The site is managed by British Waterways and designated because of its botanical, dragonfly and bird interest. The Dowles Brook is part of the Wyre Forest SSSI/National Nature Reserve and is therefore protected under the SSSI legislation. Similarly, the Ipsley Brook flows through Ipsley Alders SSSI and is therefore protected for that section. Parts of various other rivers and streams which flow through SSSI's are also protected.

- There are numerous Local Nature Reserve and Wildlife Trust Reserves within the County, which are managed specifically for wildlife. Many of these reserves have rivers and streams associated with them. Appropriate management on these sites can and does add value to the river or stream.

- The majority of Watercourses in Worcestershire have been designated Special Wildlife Sites. These are sites that are considered to be of at least County importance for biodiversity. Many rivers and streams have been designated due to specific species assemblages or habitats (such as riffle and pool streams), whilst some may have been designated for their general importance as habitats and corridors for a wide range of biodiversity. County Wildlife Sites are recognised within local planning policy and receive limited protection through the planning process.

4.2 Habitat Management and Programmes of Action

Habitat management

- In 2000 a wide range of partners joined together to form the Severn and Avon Vales Wetland Partnership. The aim is to restore floodplain habitats on a catchment wide scale within the Natural Area. Ongoing habitat work will help to improve river ecology and water quality.

- The Worcestershire Wildlife Trust, in partnership with the Environment Agency, is currently writing a scoping report about how to restore the habitat, water quality and river morphology of the Bow Brook. This report will be used to target partnership work aiming to improve the river corridor on a catchment scale.

- The Worcestershire Wildlife Trust is actively involved in river and stream management on its own land and is working with others to promote the restoration and enhancement of rivers and floodplain habitats throughout the county.

- Water level management plans have been produced for several wetland areas in Worcestershire. They are a key document to inform management of the sites and four of the high priority sites are situated around Kidderminster.

- Work is ongoing at Wilden, Puxton and Stourvale Marshes to raise water levels in rivers and streams and restore condition of these SSSI's as part of the Water Level Management Plans.

- The Environment Agency is legally obliged to ensure that it carries out its flood defence duties in a manner that enhances the environment. Opportunities to restore and enhance rivers and streams in Worcestershire are therefore taken whenever flood defence work is carried out. The Environment Agency is also involved in numerous other projects to create and restore floodplain habitats throughout Worcestershire.

- It is the responsibility of all riparian landowners to manage their river or stream. The Environment Agency has powers, but not a duty, to manage 'Main Rivers' for the purposes of flood risk. This work has traditionally involved removal of blockages, routine tree management, including pollarding of willows, and in some cases dredging and re-aligning of rivers and streams. The Environment Agency is legally obliged to carry out its duties in a manner that provides an overall enhancement to the environment.

- Dredging, desilting and re-aligning of watercourses is no longer carried out on a large scale in part due to the adverse impact that this has had on the environment, e.g. problems at Puxton, Stourvale and Wilden Marshes. Occasionally at specific locations such as at bridges or particular pinch points desilting may occur. As such many rivers and streams are showing signs of natural recovery.

- Changes in government funding and an increased environmental awareness have meant that Flood Risk activities are largely focused on high-risk areas (i.e. areas where property flooding is concentrated). As such many areas of 'Main River' will no longer be managed for flood risk in the manner in which they have been in the past. This is likely to have both benefits and costs, as degraded habitats will continue to recover naturally, whilst features that require management such as pollard trees will no longer be maintained by the Environment Agency.

Water quality and resources management

- The Water Framework Directive requires all watercourses in England to have Good Ecological Status (or Good Ecological Potential for heavily modified watercourses) by 2015. The Environment Agency is currently drawing up a programme of works that will govern the implementation of the necessary action to achieve this.

- The Environment Agency, County Landowners Association and the Farming and Wildlife Advisory Group are carrying out NVZ visits to help farmers comply with the new regulations about responsible use and storage of nitrate fertilisers and to encourage a targeted take-up of best farming practices aiming to reduce diffuse pollution.

- The River Severn is controlled using surface and groundwater releases to ensure available drinking water and to ensure that the river flow requirement will be within 10% of “natural” sequence and full seasonality is maintained.

- Cross compliance visits to farms are carried out by the Environment Agency in conjunction with the Rural Payments Agency and Natural England. This is a fundamental shift in the way farmers are supported in their work managing farmland.

- Sustainable Drainage Schemes (SUDS) are promoted for all new industrial and housing developments to ameliorate flooding and improve water quality.

- The Asset Management Plans (AMP) have resulted in significant improvements to the water environment including compensation flows on the Bow and Hadley Brooks to ensure base flows are maintained, reductions in groundwater abstractions on the Blakedown Brook to reduce the desiccation of the peat at Hurcott SSSI and the maintenance of levels at Hewell Grange to ensure the level of the lake is kept within parameters stipulated by Natural England.

- The periodic review of water companies’ assets has lead to and will continue to lead to improvements to Sewage Treatment Works across the County. Improvements include nitrate removal, phosphorus stripping, and the installation of upgraded and/or tertiary treatment. This will lead to a significant reduction in pollution to rivers and a general improvement in water quality.

- The Environment Agency has a structured approach to water management that includes monitoring stream flows and groundwater levels and issuing abstraction licences that are enforced. This helps balance the need of the abstractor and the environment. In some areas the Agency has been working with the water companies as part of the Asset Management Plan to monitor areas that have suffered from unsustainable abstraction. Abstraction has resulted in a depletion of groundwater levels and base-flow to the rivers. In some cases augmentation boreholes have been installed to improve the flow and the Environment Agency is seeking to reduce abstraction to a more sustainable level e.g. in the Battlefield Brook, Blakedown Brook and Bow Brook catchments. The Catchment Abstraction Management Strategies (CAMS) process is the policy by which the Environment Agency manages water resources in the area. Worcestershire is covered by Worcestershire Middle Severn CAMS, Avon CAMS and the Teme CAMS.

- Investigations are underway via AMP4 (Asset Management Plan) to address problems associated with ground water and low flows at Checkhill Bogs SSSI, River Sherbourne, and upper Leam/Avon Group. The outcome of the investigations will be reported and acted upon in 2009.

- The Environment Agency has been promoting its Rushy Bottoms project, the objective of which is to work with farmers to create small wetland areas to catch and treat agricultural runoff in order to reduce silt and chemical loading in the County’s watercourses.

4.2 Survey Research and Monitoring

The majority of watercourses in Worcestershire are routinely monitored for their Ecological and Chemical Quality through the General Quality Assessment Scheme (GQA). There is a network of rain gauges, river flow gauges and observation boreholes that monitor the water resources in the county.

Surveys are also carried out for specific species of conservation concern such as otter, water vole and white-clawed crayfish.

Research is ongoing at a national level investigating the control of a number of invasive alien species that are impacting upon the ecology of our rivers and streams.

5. Associated Plans

Reedbeds, Wet woodland, Fen and Marsh, Lowland Wet grassland, Canals, Otter, Water Vole, White Clawed Crayfish, Twaite and Allis Shad, Common Club-tail, Black Poplar.

6. Vision Statement

All rivers and streams in Worcestershire to be of high water quality and show geo-morphological features and species assemblages that would be expected of natural rivers and streams in the County.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Achieve Condition	Appropriate and robust water quality monitoring procedures will be in place along the length of all qualifying waterway within the River Basin District to comply with Water Framework Directive requirements in achieving good ecological status	0	2007* km	2015
Restoration	Environment Agency to secure funding and deliver the restoration of 10km of river habitat	0	10 km	2015

* Figure based on current use of 1:50 000 scale maps. This may be reviewed as the accuracy of data increases.

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Supporting Organisations
WRC RAS CA 01	**2.2**	Develop and publish Code of Good Practice for riparian owners and river users.	Nationally	2010	EA	
WRC RAS CA 02	**2.11**	Provide advice to landowners / users on best management practices for any activities affecting the ecology, geomorphology or quality of rivers and streams.	Forest of Feckenham, Severn and Avon Vales	2017	WWT	NE EA HWEHT
WRC RAS CA 03	**2.12**	Provide advice to landowners on habitat creation / restoration associated with rivers and streams.	Forest of Feckenham, Severn and Avon Vales	2017	WWT	SAVWP
WRC RAS CP 01	**3.15**	Raise awareness amongst the planning authorities and the wider public of the vital role that floodplains play in reducing flood risk and as a resource to wildlife.	Worcestershire	2017	EA	SAVWP
WRC RAS HC 01	**7.2**	Develop and implement a package of measures to rehabilitate /restore the Bow Brook and promote as a flagship for river restoration.	Bow Brook	2015	WWT	EA WCC WDC STW
WRC RAS HS 01	**6.1**	Ensure all flood risk management work results in a net enhancement to the biodiversity of watercourses.	Worcestershire	2017	EA	

WRC RAS HS 02	**6.1**	Ensure that all statutory permissions and consents do not adversely affect the aquatic environment and wherever possible provide an enhancement.	Worcestershire	2017	EA	WCC WDC, WorcsCC, MHDC, WFDC, BDC, RBC
WRC RAS HS 03	**6.18**	Promote and enforce compliance with waste regulations to achieve a reduction in diffuse pollution to a level sufficient to meet EU and national requirements in all watercourses.	Worcestershire	2015	EA	
WRC RAS PL 01	**9.17**	Review and update this Habitat Action Plan following completion of the Severn River Basin Management Plan to ensure that BAP actions and Water Framework Directive Programmes of Action are complementary.	Worcestershire	2009	WCC	EA WWT
WRC RAS PL 02	**9.18**	Implement Environment Agency Policy on culverting.	Worcestershire	2017	EA	WCC WDC, WorcsCC, MHDC, WFDC, BDC, RBC
WRC RAS PL 03	**9.18**	Abstraction licences to be granted only where abstraction levels are proved to be sustainable.	Worcestershire	2017	EA	
WRC RAS RE 01	**10.15**	Identify all flood defences in Worcestershire that protect only agricultural land and review the need for their maintenance.	Worcestershire	2015	EA	SAVWP

EA – Environment Agency
NE – Natural England
WCC – Worcestershire County Council
WWT – Worcestershire Wildlife Trust
FWAG – Farming and Wildlife Advisory Group
WDC - Wychavon District Council
WorcsCC - Worcester City Council
MHDC - Malvern Hills District Council
BDC - Bromsgrove District Council
WFDC - Wyre Forest District Council
RBC - Redditch Borough Council
HWEHT – Herefordshire and Worcestershire Earth Heritage Trust

SAVWP – The Severn and Avon Vales Wetland Partnership is a partnership of organisations comprising the Environment Agency, Natural England, The Wildlife Trusts, the Farming and Wildlife Advisory Groups, Department of Food and Rural Affairs (Defra), National Farmers Union, the Association of Drainage Authorities, County and Local Councils, the RSPB, the Wildfowl and Wetlands Trust and Severn Trent Water. The partnership works within the Severn and Avon Vales Natural Area to restore and enhance the wetland resource found there.

Road Verges Habitat Action Plan

1. Introduction

Two priority UK BAP species occur on road verges in Worcestershire: *Dianthus armeria* Deptford pink and *Arabis glabra* tower mustard. Many road verges in the county are notable because of their unimproved grassland habitat that is of local and UK BAP quality.

2. Current Status

2.1 Description of habitat

The road verge is an important wildlife habitat resource in Worcestershire. A roadside verge is defined for the purposes of this action plan as the thin ribbon of the highway that lies on either side of a road. It is confined by a boundary: usually a hedgerow, wall or fence away from the road. The boundary is not considered as part of the verge in this document. The verge may frequently incorporate a ditch, which can represent an additional valuable wildlife feature.

Road verges provide valuable wildlife corridors. Due to a lack of intensive management many verges contain an extensive range of flora and fauna. Some of Worcestershire's rarest species exist on road verges, for example the only known colony of Deptford pink in the county exists on the A449 road verge. Our knowledge of road verges is superficial and incomplete, as they have rarely been studied as a habitat.

Road verges show great variability in, for example:

- Age – some roads are from the original unplanned paths, whilst others were created as a result of the Enclosure Acts 1750. Many major road verges have arisen from modern road schemes in the last 30 years.
- Width – anything from less than 1m to more than 15m.
- Soil – top or sub soil.
- Geology – acidic, neutral or calcareous.
- Aspect and slope.
- Extent of shading by vegetation.
- Drainage – may have trench drains, stone filled drains or no drainage.
- Management – from unmanaged to regular cutting.
- Ownership – County Council or adjacent landowner.

All these factors interact to determine the flora and fauna that inhabits or uses a particular stretch of road verge. Grassy verges are of particular concern in this plan but scrub and trees can also be present. The verge may also have geological or archaeological interest.

Traditional management was generally benign to wildlife on road verges. Lengthsmen employed by the Highways Department usually hand-cut verges with a scythe or slasher and hay making or grazing on verges was common. The cost of this labour intensive work and the development of the mechanical flail in the 1960s resulted in a far less wildlife-friendly procedure of flailing by tractor or mowing. This leaves the cuttings on the verge, which enriches the soil, results in thick mulch and suppresses all but the most vigorous plants.

2.2 Distribution and extent
In Worcestershire the estimate for the total length of road verges is 2296 km with a total resource of approximately 695 ha.

2.3 Legislation
There is no legislation protecting the biodiversity value of the road verge habitat except in instances where those species present have their own legal protection. Deptford pink is protected under Schedule 8 of the Wildlife and Countryside Act.

2.4 Summary of important sites
Road Verge Nature Reserves (RVNRs) have existed in Worcestershire for almost 30 years. Worcestershire Wildlife Consultancy undertook a review of all RVNRs in 1995. 44 sites qualified for continued inclusion according to the criteria used, with a total area of 4.4 ha and an average size of 0.1 ha.

A cluster of sites around Kidderminster that comprise one of only two meta-populations of tower mustard in the UK

3. Current factors affecting the habitat
The main factors leading to loss of or damage to the wildlife interest of the road verge habitat are:

- Dumping of spoil or fly-tipping.
- Temporary dumping / storage of road-building materials.
- Trenching for mains services.
- Methods used in ditching.
- Car and lorry parking.
- Vehicles including tractors impacting on the verge edge.
- Hedge cutting machinery.
- Use by travellers.
- Pollution and spillage from vehicles.
- Run off and spray containing salt.
- Herbicide application and pesticide drift.
- Over management y adjacent landowners.
- Trampling by horses.
- The spread of alien species or weeds, including *Fallopia japonica* Japanese knotweed, *Brassica napus* oil-seed rape and *Senecio jacobaea* ragwort.
- Lack of management leading to invasion by coarse grasses and scrub vegetation on grassland.
- Planting and growth of trees on grassland.
- Planting of cultivated / ornamental plant varieties.
- Reseeding with inappropriate seed mixes.
- New urban developments including road widening.
- Inappropriate cutting regimes.

4. Current Action
4.1 Local protection
Two sites that incorporate road verges have been notified as Sites of Special Scientific Interest: Cropthorne New Inn (0.123 ha) on the A44 and Burcott Lane Cutting (0.292 ha) at Blackwell near Bromsgrove. Both were notified for their geological interest. At several other sites, including Castlemorton Common and

the Malvern Hills SSSI, the road verge is incorporated where the designation covers land on both sides of the road.

4.2 Habitat management and programmes of action

Usually, the adjacent landowner owns the land forming the road verge. The County Council are the guardians of the public's right to use the road and are generally responsible for the maintenance of the road verge. The maintenance of the ditch is the responsibility of the landowner. Worcestershire County Council's policy for cutting road verges has safety and visibility as the primary concern. At present on rural roads there are generally two cuts a year done as late as possible after mid-April. Urban roads, which may include some villages, are cut five times a year every six weeks from mid-April. District Councils may enhance this by three or more cuts a year. All cuts are of one metre from the edge of the road, including visibility splays at junctions.

Motorways and trunk road verges are under the control of the Department for Transport. In Worcestershire this includes part of the M5 and M50 as well as the trunk roads A38, A46, A449 (due to be de-trunked) and the A456. These are cut under contract primarily with safety considerations in mind. Most are therefore cut as one metre swathes from the edge in addition to the visibility areas, usually twice a year. Some areas are never cut.

Since 1995 Worcestershire Wildlife Consultancy has been contracted by Worcestershire County Council to manage and continually review all of the Roadside Verge Nature Reserves according to management plans agreed with the County Council. The Consultancy has developed four different options for appropriate management of the RVNRs, with a fifth option of non-intervention. The addition of new sites to the RVNR programme is on an ad-hoc basis as no complete botanical survey of Worcestershire road verges has been carried out.

4.3 Survey, research and monitoring

In 1998 a botanical survey of the verges on motorways and trunk roads in the county was commissioned by the contractors for a three-year period to cover the grassland, scrub and wood edges but not any planted blocks. This will give full habitat descriptions and provide management prescriptions for implementation.

Several sites have recently been targeted by the Worcestershire Flora Project and Plantlife for rare and uncommon plants, which will be surveyed in 1998/99 for possible inclusion in the RVNR list. As well as Deptford pink and tower mustard, other threatened species of interest include *Vicia bithynica* bithynian vetch, *Campanula patula* spreading bellflower and *Isatis tinctoria* woad.

Worcestershire Wildlife Trust have produced the 'Wildlife on the Verge' information pack, which includes information on roadside verge habitats, how the public can get involved (including two specific activities for schools) and management techniques to benefit wildlife.

4.4 Action for priority species

Plantlife have secured funding from the Sita Trust for an 18-month project on tower mustard. The sites in Worcestershire where this species is found are one of only two surviving meta-populations in the UK. Only seven sites now remain in the county, all clustered around Kidderminster. The project will involve all seven

extant (surviving) sites and at least one other proposed introduction site (presently unknown). Although the sites are currently isolated from one another, conservation action will restore the meta-population through increasing the abundance of tower mustard via direct recruitment and the seed bank, increasing the availability of suitable habitat and re-introducing plants to new nearby sites.

5. Associated Plans

Veteran Trees, Urban, Semi-natural Grassland, Ancient/Species-rich Hedgerows.

6. Vision Statement

To reliably secure appropriate management of all of the county's road verges that will maximise the potential of each site to support a diverse flora and fauna.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Expansion	Increase the number of sites having a viable population of tower mustard *Arabis glabra*	7	8	2010
Achieve condition	100% of current RVNRs to be under an appropriate management regime and achieve good ecological condition	0	45	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC ROV HS 01	**6.2**	Secure and or implement appropriate management regime on all RVNRs so that all achieve and maintain good condition.	Worcestershire	2015	WWC	WCC
See additional actions being undertaken by Plantlife for the *Arabis glabra* tower mustard project at www.ukbap-reporting.org.uk.						

References and further information

Barker, S (1995). *Review of Worcestershire's RVNR.* Worcestershire Wildlife Consultancy.

Worcestershire Wildlife Trust (1995). *Wildlife on the Verge.* Worcestershire Wildlife Trust / Bass Wildlife Action Fund

Urban Habitat Action Plan

1. Introduction

The contribution that urban areas can make to biodiversity in supporting a range of habitats and species is frequently overlooked. In addition to this, there will be a huge increase in development pressure within Worcestershire over the lifetime of this BAP as a result of regional housing allocation. This is an added driver to ensure that biodiversity is given adequate and appropriate consideration now within development control forward planning and policy at both a county and regional level. The second challenge will be to ensure that this is communicated through the planning application process to achieve biodiversity gain on the ground, for the benefit of both people and wildlife living in Worcestershire.

2. Current Status

2.1 Description of habitat

For the purposes of this plan the urban habitat includes all those areas of land, water and physical structures capable of supporting biodiversity, both in terms of providing shelter and as foraging habitat, which are located within the planning boundary of a major settlement as defined in relevant Local Development Documents.

However, many biodiversity-rich habitats appear in both urban and rural areas and have their own Habitat Action Plans. They will not therefore require specific action under this plan (examples include rivers and streams, woodland, road verges, orchards and neutral grassland). Certain habitats though are unique to, or typical of, the urban environment and it is these that this plan will focus on. They include:

Municipal parks

Though they are sometimes heavily managed these are of particular importance, not only for the broad biodiversity they contain but also because they are often the first point of contact between people and wildlife.

Brownfield sites (i.e. previously developed land)

Previously developed sites, especially those that have been ‘derelict’ for some time can be extremely important for biodiversity. A number of semi-specialist species are closely allied to urban brownfield locations, whilst a broad range of invertebrates and reptiles can often be found.

Allotments

Allotments are a feature of many of Worcestershire’s built up areas and have a significant role to play in the conservation of urban biodiversity. In Worcester City they provide a refuge for some of the best populations of *Anguis fragilis* slow-worm in the West Midlands and elsewhere they provide a broad range of grassland, herb and scrub habitats and act as reservoirs of biodiversity for the wider townscape. This function can be particularly valuable where they occur adjacent to ecological corridors such as canals or rail infrastructure.

Churchyards
Though churchyards are often heavily managed they can be very valuable for lichens and in some places relict grassland communities. Where they have untended corners these can develop into suitable habitats for priority species such as slow worm. Some will also contain good numbers of significant trees and shrubs and can be important to the local landscape character as well as for biodiversity.

Gardens
Though frequently overlooked in the past gardens make a substantial contribution to urban biodiversity. Whilst they may contain non-native plants these still provide habitat for nesting birds, invertebrates and other wildlife. In places networks of gardens form the only 'green' corridor in the landscape and can play a vital role in ensuring the permeability of our towns for wildlife. In many cases the garden will be the first and most frequent point of contact between people and the outdoors.

Playing fields and/or school grounds
Whilst the frequently mown pitch of an open playing field has limited value for wildlife the surrounding grassland areas can be rich in biodiversity. In addition thick hedges, trees and shrubs border many school grounds and playing pitches adding to their value. Open spaces, managed or otherwise, can also provide a significant buffer to rapid urban runoff, an opportunity for people to experience the outdoors and in some circumstances an important component of wider green corridors and networks.

Street trees
Street trees play an important role in bringing wildlife into urban spaces. They can offer feeding, nesting and roosting opportunities for birds, be valuable for invertebrates, lichen and fungi and help to provide or strengthen feeding and commuting routes for bats and other mobile species. In addition they help to ameliorate the effects of atmospheric pollution and can be an attractive addition to the street scene.

The 'built up' environment including both industrial and domestic buildings
Buildings and built infrastructure provide a significant roost and nesting resource in the urban environment. These can be especially important for priority species such as bats and scarcer birds including *Apus apus* swift and *Falco peregrinus* peregrine. Careful connection of such features via green corridors can increase their value markedly.

All of these features can accommodate wildlife and often play a valuable role in the conservation and enhancement of our native biodiversity. In addition they are a resource for human activity and can be used for environmental education purposes. Furthermore, it is important to recognise that the urban environment offers many people their first contact with wildlife.

2.2 Distribution and extent
In the context of this plan the urban environment is taken to mean the larger settlements of Worcestershire. Large villages such as Bretforton and Fernhill Heath are included while the obvious towns such as Malvern, Kidderminster and Worcester provide the bulk of the resource. There are also a number of 'urban'

sites that fall within otherwise rural localities. Examples include Throckmorton airfield and the complex of railway sidings at Honeybourne.

Given that Worcester has been designated as a 'growth point' in the Regional Spatial Strategy and that the A38 High Technology Corridor passes through the centre of the county it seems likely that the urban resource will grow rapidly over the life of this plan. It will be important to ensure that this growth is managed properly and that the biodiversity benefit it can offer is realised. Growing pressure on existing brownfield sites must also be managed sensitively, with suitable protection put in place for existing features of interest (see section 3 below).

2.3 Legislation

- The Natural Environment and Rural Communities (NERC) Act 2006 establishes a duty for Public Bodies to have regard to Biodiversity in their decision-making processes. This duty does not differentiate between the urban and rural environment and is therefore relevant in the urban planning context.

- Tree Preservation Orders (TPOs) can be placed on individual trees or groups of trees.

- The Hedgerow Regulations 1997 provide some measure of protection through a system of notification to Local Authorities. They are only relevant to hedges that are not part of a residential curtilage but can still be important in the urban and urban fringe context.

- Listed buildings and Conservation Areas are subject to planning restrictions and may be of high value for biodiversity. Where Local Authorities are carrying out Conservation Area Appraisals it is considered best practice to include consideration of biodiversity.

In addition a number of urban sites hold populations of protected species that may be protected under one or more Act of Parliament. Most of these species have a UK and some a Local BAP and further details can be found within those plans.

2.4 Summary of important sites

Much of the urban resource has some value for biodiversity but there are some sites that are worthy of particular mention.

- Allotment sites in Worcester City. These are amongst the best sites for slow worms in the West Midlands and can hold significant breeding populations.
- Honeybourne Sidings. A partially disused railway yard of particular importance for invertebrates including the Local and UK BAP species *Pyrgus malvae* grizzled skipper.
- Canal basins. Found in several of the county's towns these can be important for invertebrates, scarce plants and bats. Their links to the canal corridors enhances their value.
- Terraced houses, especially in Worcester City. These are now the most important sites in the county for breeding colonies of swift.

- Urban orchards. Primarily associated with Evesham and Worcester these habitats are of tremendous value for biodiversity and can also be important from a cultural and historical perspective.
- Large Parks. Found in most of the bigger towns but perhaps exemplified by the ones in Great Malvern and Worcester City.
- Redditch was designated a new town in 1964 to relieve growing pressure on the West Midlands conurbation. This resulted in its population more than doubling to fill the housing developments built to expand the original settlement. The development of the town was designed to incorporate many of the natural features of the surrounding countryside and to include major landscaping works including the planting of 2 million trees. The borough today incorporates a green network of six local nature reserves, over 100 hectares of ancient semi-natural woodland, wildflower meadows, the 800 acre Arrow Valley Country Park as well as an extensive pond network important for species such as *Triturus cristatus* great crested newt.

3. Current factors affecting the habitat

- Management. The quality and biodiversity potential of urban habitat can be overlooked, ignored or inappropriately identified leading to deficiencies in management. In addition much of the urban habitat resource has to meet the needs of multiple users and cannot always be managed in the most appropriate manner to maximise biodiversity benefit

- Development Pressure. Urban locations are very important ecologically and often contain protected species. Unfortunately such areas are also subject to significant development pressure, in part as a result of Government policy on the re-use of brownfield sites. Such pressure is leading to a decline in the overall habitat resource but it can also act a driver for providing biodiversity benefit within the built environment.

- Human Activity. There are many associated problems and benefits from this variable, including the effect of domestic animals, especially cats, and the increased use of footpaths, parks etc.

- Contamination. Industrial pollutants may be present and can have a detrimental effect upon the habitat, biodiversity and site users.

- Isolation and fragmentation. Many urban habitats suffer from fragmentation as a result of development or changing land use. This combined with the small size of many sites can lead to a decline in species diversity and population size even in situations where the habitats themselves are well managed.

- Health and safety concerns. This can be a particular problem with respect to street trees and their proximity to roads and public buildings.

4. Current Action

4.1 Local protection

There are a number of legal designations relevant to Worcestershire's urban environment.

- There is one European protected site, The Lyppard Grange SAC in Worcester.

- There are several SSSIs including Ipsley Alders Marsh in Redditch and Northwick Marsh in Worcester.

- There are also several urban Local Nature Reserves spread widely throughout the urban areas of the county.

4.2 Habitat management and programmes of action

- Planning Policy Statement 1 and Planning Policy Statement 9 provide planning guidance concerning sustainable development and biodiversity. These Planning Policy Statements do not differentiate between the urban and rural environment and are therefore relevant in the urban context.

- English Nature produced two research reports (Harrison et al., 1995 and Barker, 1997) on accessibility to greenspaces and green networks. These suggested targets for densities of Local Nature Reserves and the distance greenspaces should be from each urban resident. Natural England has now developed and published a set of benchmarks for the provision of access to places of wildlife interest. This consists of a series of Urban Greenspace standards that aim to ensure people living in urban areas have access to wildlife-rich green spaces within a certain distance of their home.

- Worcester City Council has established the concept of Greenspaces and green networks into its planning system. The Greenspaces are underpinned by strong environmental policies at a local level and have helped to promote biodiversity data collection throughout the City. The City Council has also published a Biodiversity and Trees Supplementary Planning Document as part of their Local Development Framework.

- Several Local Authorities have Service Level Agreements with the Worcestershire Biological Records Centre. This funding is helping to promote data collection in urban as well as rural parts of the county.

- The Worcestershire Special Wildlife Site Partnership (of 13 organisations) maintains a register of sites which although non-statutory are identified in planning policy. Such sites can be selected for habitat or species value and are found widely throughout the urban areas of Worcestershire. Though most will be habitats that are not directly 'urban' (for example woodlands within Worcester) others will be more explicitly tied to their urban locations e.g. allotments selected for slow worm populations.

- Some District Councils already have strategies for biodiversity action specific to their area, some of which may be specific to the urban areas. Typically these actions will take the form of a locally based strategy such as The Bromsgrove Water Vole Strategy. Redditch Borough Council has recently produced its own Biodiversity Action Plan that covers habitats and species of interest across the whole district.

- Biodiversity-friendly and Sustainable building design is becoming more mainstream with initiatives such as the BRE EcoHomes scheme and the

Code for Sustainable Homes leading the way. In combination with accepted standards such as ISO 140001 they promote and guide more sustainable building techniques.

4.3 Survey, research and monitoring

Monitoring of urban biodiversity has been somewhat piecemeal in the past but there have been several important projects carried out in the county. In Worcester there have been surveys for slow worms and great crested newts, a full appraisal of over 80 'Greenspaces' and a comprehensive assessment of the wider 'green network' of interconnecting open space and gardens.

Malvern Hills DC and Wychavon DC have carried out open space audits covering urban greenspace as well as the wider countryside and Bromsgrove DC has initiated a survey for *Arvicola terrestris* water vole.

4.4 Action for priority species

The following action for priority species is already ongoing.

- Bromsgrove Water Vole Strategy. Resulting from surveys in Bromsgrove town the strategy sets out a number of habitat management mechanisms and targets designed to protect and enhance suitable water vole habitat along watercourses in the town.

- Worcester City Slow-Worm survey. Ongoing survey and site protection in the city designed to protect and enhance the important populations found within the greenspace network.

5. Associated Plans

Bats, Slow worm, Great Crested Newt, Otter, Water vole, Stag beetle, Traditional Orchards, Ancient/Species-rich hedgerows, Veteran trees, Road verges, Canals, Rivers and streams, Ponds and Lakes.

6. Vision Statement

The BAP Partnership will aim to protect, value and promote urban habitats, enhance them through and design them into new developments and ensure that they are linked together to form a functioning framework of sites and corridors both within urban areas and out into adjacent countryside for the benefit of biodiversity and people.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Achieve condition	All Local Planning Authorities to adopt the Urban Greenspace standard recommended by Natural England of a minimum level of 1 ha of Local Nature Reserve being provided per 1000 population where the primary aim and function of that land is for the promotion and protection of biodiversity and for local residents to learn about and enjoy wildlife. This land should be in addition to any standard adopted for the provision of sport, play and recreation space.	0	1 ha per 1000 population	2017
Expansion	50% of eco schools undertaking a biodiversity audit and to have a biodiversity management plan in place for their school grounds	0	125	2017

8. Actions

Action Code	Action Category	Action Text	Location	Action Timescale	Lead Organisation	Support Organisation
WRC URB CA 01	**2.1**	Develop at least one demonstration site for best practice in urban biodiversity and or greenspace management / enhancement.	Worcestershire	2017	All District Councils	WCC, WWT
WRC URB CP 01	**3.5**	Use local media to highlight and promote a positive approach to biodiversity planning and to raise residents' awareness of urban biodiversity issues through the publication and celebration of relevant good news stories.	Worcestershire	2017	All District Councils	
WRC URB CP 02	**3.8**	Use local media and local events to promote the contribution of urban biodiversity and urban greenspace to mental and physical wellbeing.	Worcestershire	2017	All District Councils WCC	
WRC URB HC 01	**7.4**	Using Urban Greenspace concept, identify priority areas for habitat restoration / creation in each urban area to maximise the connectivity of areas of semi-natural habitat across the urban landscape. Develop strategy for each urban area for taking forward habitat creation/restoration on prioritised sites. Use	Worcestershire	2012	All District Councils WCC	

		strategy to inform Greenspace work.				
WRC URB HC 02	**7.2**	Ensure implementation of all habitat creation/restoration plans for priority areas identified within the strategy produced for action WRC URB HC 01.	Worcestershire	2015	All District Councils	
WRC URB HS 03	**6.6**	Review existing or produce protocols and environmental guidance for dredging activities relating to urban freshwater habitats (including rivers, canals, ponds, streams, ditches, SuDS, culverts etc), revise as necessary and promote to all relevant parties.	Worcestershire	2010	EA	
WRC URB SU 01	**13.3**	Use aerial photographs and GIS data to identify and establish an inventory of large urban gardens and urban garden and street trees that should be protected from development.	Worcestershire	2010	WCC	

WCC – Worcestershire County Council **WWT** – Worcestershire Wildlife Trust **EA** – Environment Agency

References and further information

www.fieldsintrust.org - the only independent UK wide organisation dedicated to protecting and improving outdoor sports and play spaces and facilities. FIT gives planning leadership through one of its key publications, the Six-Acre Standard, which aims to help land use planners ensure a sufficient level of open space to enable residents to participate in sports and games with an emphasis on access for children to play grounds and other play space.

www.english-nature.org.uk/special/greenspace/ - Natural England's Urban Greenspace Standards.

Otter

Lutra lutra

Species Action Plan

1. Introduction

The European otter sub-species is listed as globally threatened on the Red Data List. It is a priority UK BAP species, the population here being internationally significant as numbers have declined as a whole across much of Western Europe.

2. Current Status

2.1 Ecology and habitat requirements

The otter is one of the UK's top mammalian predators and its presence is an important indicator of the chemical and biological health of our wetlands. It is found in both saline and freshwater habitats ranging from coastal areas and estuaries to ponds and lakes, canals, small streams and ditches, although natural fast flowing rivers are preferred. Territory sizes have most frequently been measured in terms of length of waterway, but this may not present an accurate picture in places where part or all of the range consists of lakes or ponds, or when comparing very large waterways with small ones. Male otters are frequently found to maintain territories of up to 50 km of riverbank but this may not reflect the total area of habitat occupied. Likewise, otters found to maintain territories along seemingly short sections of river may in fact be using extensive areas of habitat adjacent to the main body of the river: this will include wet woodland and scrub as well as more obvious wetland habitat. Spraints (droppings) are used by otters to mark their home ranges, and so are usually found in prominent places such as boulders and bankside ledges.

The size of an individual otters territory will be dictated to a great extent by the available food resource within that area. Otters need on average 1kg of food per day, which is about 10 percent of their body weight. Their diet comprises about 80% fish but they will also take birds and bird eggs, molluscs, crustaceans, amphibians and small mammals. Slower fish like *Anguilla anguilla* eel, *Perca fluviatilis* perch and *Rutilus rutilus* roach are preferred, as they require less energy to catch. Good quality water is critical in providing a sufficient food supply.

Otters are solitary animals except during mating and whilst a female is rearing cubs, who will stay with her for around 12 months before dispersing. Otters will use a wide variety of structures and vegetation types for resting in during the day and a single individual will make use of a large number of different resting areas throughout its territory. These areas may range from cavities beneath tree roots or behind bankside support structures, hollows within piles of flood debris and relatively open and uncovered sites such as a depression within a reedbed where the vegetation is relatively short. Enclosed dens are usually termed holts and open resting sites couches. Natal holts are much more difficult to find than resting holts with evidence suggesting that females are unsurprisingly much more careful to conceal the presence of both the holt itself and themselves when coming and going. It is also likely that the young are moved after birth and reared in a different holt to the one they were born in.

2.2 Population and distribution

Formerly widespread throughout much of the UK, the otter underwent a rapid decline in numbers from the 1950s to the 1970s, caused primarily by the introduction of organochlorine-based pesticides and exacerbated by hunting and loss of habitat. The first national otter survey of England in 1977-79 showed that the only significant populations remaining were along the Welsh borders and in the south west, with only very isolated and fragmented populations elsewhere. In total only 6% of almost 3000 sites visited across the country during this survey showed evidence of otters. The species was effectively lost from the midland counties of England, including Worcestershire, by the 1980s.

Otter hunting ceased in 1978 when the species received full protection under the Conservation of Wild Creatures and Wild Plants Act 1975 and the two main organochlorine compounds in common agricultural use, Deildrin and Aldrin, were banned in 1981 and 1991 respectively. Since then three more nationwide surveys have been carried out and show that otter populations are making a gradual recovery (table 1). It is estimated that otters have now re-colonised around 30% of their former habitat.

Table 1. Results of national surveys expressed as a percentage of sites where signs of otters were found.

	No. Sites[1]	1977-81[2]	1984-6	1991-4	2000-2
Ireland	2373	92%			
Scotland	2650	57%	65%	83%	
Wales	1102	20%	38%	53%	
England	2940	6%	10%	24%	34%

Source: Chanin P (2003). **Original data from:** Chapman & Chapman (1982); Green & Green (1997);Andrews, Howell & Johnson (1993); Strachan & Jefferies (1996), Crawford (2003). [1] Data selected only from sites surveyed in all of the first three surveys. [2] Irish survey was carried out in 1980–81, others in 1977–1979.

Surveys by Worcestershire Wildlife Trust during the 1991-94 nationwide survey revealed that otters were present on all of the county's major watercourses. There was an apparent stronghold within the Teme catchment near the Worcestershire / Shropshire border and in the middle Severn. During the latter half of the1990s otters also went on to re-colonise the Avon catchment.

Today there are records throughout the county (figure 1) from a variety of water bodies, including smaller streams as well as the rivers, and also records that relate to either road casualties or sightings in places where otters are forced from the watercourse they are using to negotiate a road bridge. Breeding undoubtedly occurs in Worcestershire as young otters have been found. All three canals are used by otters, with a concentration of records on the Staffordshire and Worcestershire canal where it passes through Kidderminster.

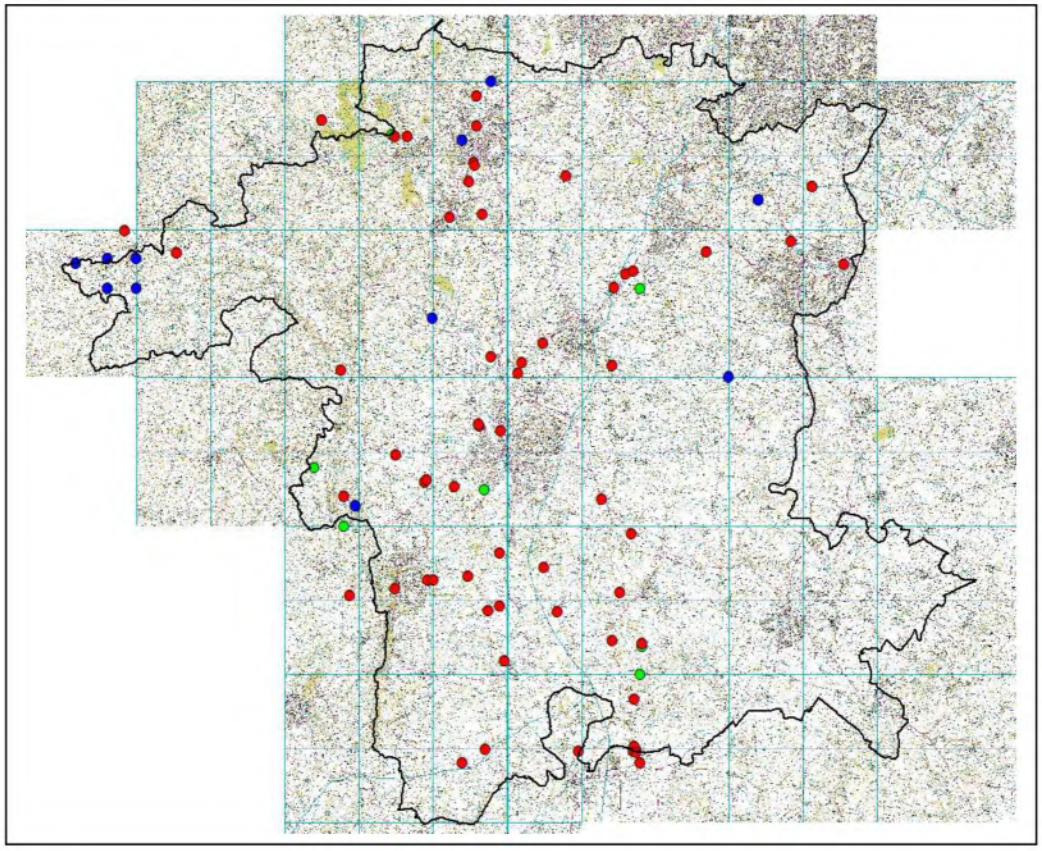

Figure 1. Records for Otter in Worcestershire to 2007. Records pre 1979 are shown blue, 1980-1999 shown green and 2000-2007 shown red. Data provided by Worcestershire Biological Records Centre. *Note some data is displayed at hectad or tetrad level.*

2.3 Legislation

The otter is listed on Appendix 1 of CITES, Appendix II of the Bern Convention and Annexes II and IV of the Habitats Directive. It is protected under the Conservation of Wild Creatures and Wild Plants Act 1975, Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 of the Conservation (Natural Habitats, etc.) Regulations 1994 (Regulation 38).

In May 2001 a national Environment Agency bylaw was passed banning the use of Eel fyke nets without an otter guard to prevent accidental deaths.

2.4 Summary of important sites

All water courses and water bodies within the county plus their associated wetland habitats are potentially important sites for otters. Currently, the River Teme is the best 'site' for otters, followed by the Severn. The current data highlights how widely the otter is now distributed across Worcestershire, and also the variety of wetland habitats they are using, from the major rivers to quite small streams. Still water bodies, particularly those stocked for fishing, are also a valuable (if controversial) resource for otters.

In 2001 Worcestershire Wildlife Trust completed the creation of the Gwen Finch nature reserve, a wetland near Nafford lock on the River Avon, and otters are now regularly using the site.

3. Current factors affecting the species

- Historically, the pollution of watercourses from pesticides, heavy metals, industrial activity and synthetic pyrethroid sheep dips was the single biggest cause of the otters decline. However, water quality is now improving on all rivers with 94% achieving at least good status in 2000.

- Insufficient prey resulting from poor water quality, low flows or river modifications. Pollution, and the consequences for fish populations, is no longer believed to be a significant limiting factor in the recolonisation of a watercourse by otters. Low flow and river modifications are still an issue however. Eel populations, which form a significant part of the otters diet, are declining throughout Western Europe due to over fishing.

- Drainage and other agricultural improvements resulting in the degradation or complete loss of bankside features or wetland habitat such as marsh, reedbed and wet woodland.

- Canalisation and other hard-engineering modifications to rivers and canals resulting in loss of bankside habitat and adjacent wetland habitat or the disconnection of the watercourse from its associated wetland habitat.

- The mortality rate as a result of road accidents is increasing due to otters having to leave the watercourse to negotiate road bridges and other man-made obstacles. This is a particular problem during high-flow or flood events when passage underneath a bridge or other feature may be blocked. There may also be a similar problem where railways and rivers meet.

- Conflict with fisheries interests and possible persecution.

- Human disturbance including conflict with domestic dogs.

4. Current Action

4.1 Local protection

All of the county's major rivers, the three canals and many smaller streams, as well as some standing water bodies, are designated as County Special Wildlife Sites. About 16% of the reedbed sites within the county, covering about 30% of our reedbed resource, are notified as Sites of Special Scientific Interest. The largest is within Hewell Park Lake SSSI. Others include Upton Warren, Westwood Great Pool, Feckenham Wylde Moor and Oakley Pool. Other reedbeds are classified as Special Wildlife Sites. Of the other standing water bodies within the county, Bittell Reservoir and Hurcott and Podmore Pools are also designated as SSSIs. Some SSSIs and SWSs also incorporate wet woodland.

4.2 Site management and programmes of action

- The 10-year Otters and Rivers Project, begun in 1992 and led by The Wildlife Trusts in partnership with the Environment Agency and the water companies, worked to provide an advisory service for land managers, install artificial holts, create and restore habitat along rivers, advise on

otter mitigation regarding new roads and development, provide training and produce publicity material.

- The work of the Otters and Rivers Project is being continued through the Water for Wildlife partnership, involving The Wildlife Trusts', the water companies (Water UK), the Environment Agency and other key partners. Details of current initiatives underway through the project and copies of publications can be found on www.waterforwildlife.org.uk. The project produces an annual round-up of statistics from participating Wildlife Trusts. In 2006, of 33 Trusts who responded, 97% said that otter numbers were stable or increasing within their county, almost 2,500 sites were surveyed for signs of otters and 37 otter holts were created. In Worcestershire the Water for Wildlife project has resulted in artificial holts being built on Severn Trent Water operational sites as well as the development of several small wetlands.

- The Environment Agency takes into account the requirements of otters in all its riverside capital and maintenance works and in carrying out all its regulatory functions. For example, land drainage consents for bridges must include an otter underpass. Management plans and corporate strategy documents contain commitments to improve river habitats for species such as the otter and *Arvicola terrestris* water vole and to restore and create wetlands where appropriate as part of their wider flood risk management schemes.

- The Severn and Avon Vales Wetland Partnership aims to identify and restore large areas that could lead to significant increases in wetland habitat.

- Countryside Stewardship and Environmental Stewardship have resulted in improved management of waterside habitats in certain areas.

- The development of Worcestershire Wildlife Trust's Gwen Finch wetland reserve on the River Avon has created one of the county's biggest reedbeds and provided suitable habitat for breeding otters.

4.3 Survey, research and monitoring

- The four national otter surveys have included two 50km squares – SP north-west and SO south-east – that cover parts of Worcestershire. A great deal of the work during the forth survey was carried out by Wildlife Trust officers as part of the Otters and Rivers Project.

- The Otters and Rivers Project also carried out county distribution surveys on a catchment basis every year between 1992 and 2002. Further surveys are conducted by volunteer groups.

- JNCC have published a Framework for Otter Conservation in the UK 1995-2000.

- The Life in UK Rivers venture, involving English Nature, Countryside Council for Wales, Environment Agency, Scottish Environment Protection Agency, Scottish Natural Heritage and the Scotland and Northern Ireland

Forum for Environmental Research, published *Ecology of the European Otter* (Chanin, P) as part of the Conserving Natura 2000 Rivers Ecology series.

- The Highways Agency has funded investigations along all the major trunk roads into the extent of otter road deaths and the mitigation works required in future road modification and building schemes.

- Between 1988 and 2003 research into otter mortality involved carcasses being collected and sent for post-mortem examination to firstly the Veterinary Laboratories Agency and latterly the Wildlife Veterinary Investigation Centre. Several papers have been published on the results of this work, the latest of which (Simpson, 2006) is available online via a link from the Water for Wildlife project website (address above). The paper contains a reference section listing other relevant articles.

5. Associated Plans

Wet woodland, Reedbeds, Fen and Marsh, Lowland wet grassland, Urban, Canals, Ponds and Lakes, Rivers and Streams.

6. Vision Statement

That otters will return to all areas of the county in which they were found prior to their decline and that sufficient suitable wetland habitat exists to support a strong, viable breeding population.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Range	Increase otter numbers in the county to achieve 85% occupancy of 10km squares	18 hectads	23 hectads	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC OTT HS 01	**6.2**	Ensure that plans for the construction or modification of road bridges over watercourses include design features to ensure safe passage for otters and to limit otter road traffic casualties during high flow and flood events.	Worcestershire	2017	WCC	WWT, EA, WDC, WorcsCC, MHDC, WFDC, BDC, RBC

WCC – Worcestershire County Council
WDC – Wychavon District Council
MHDC – Malvern Hills District Council
WWT – Worcestershire Wildlife Trust
WorcsCC – Worcester City Council
WFDC – Wyre Forest District Council
EA – Environment Agency
BDC – Bromsgrove District Council
RBC – Redditch Borough Council

References and further information

Chanin, P (2003). *Ecology of the European Otter.* Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.

Simpson, V, R (2006). *Patterns and significance of bite wounds in Eurasian otters (Lutra lutra) in southern and south west England*. The Veterinary Record, January 28, 2006.

Grogan, A., Philcox, C and Macdonald, D (2001). *Nature Conservation and Roads: Advice in relation to otters.* Wildlife Conservation Research Unit.

Dormouse
Muscardinus avellanarius
Species Action Plan

1. Introduction
The dormouse is a species of national importance as it has declined dramatically over the last century, becoming extinct in up to 7 counties (comprising half of its former range) during this period. It is classed as Vulnerable in the UK Red Data Book, is a priority species within the UK BAP and a species of particular concern / importance in Worcestershire.

2. Current Status
2.1 Ecology and habitat requirements
The hazel dormouse is a distinctive native British mammal, which is infrequently seen or recorded due to its rarity, arboreal lifestyle and nocturnal habits. The dormouse ideally requires a woodland habitat with a large structural and species diversity that is managed on a medium (10-15 year) coppice rotation. Standard trees should be retained as dormice nest in hollow tree branches and can hibernate amongst tree roots. However, dormice can be found in a variety of other habitats including hedgerows, scrub and mixed, young coniferous woodland. They eat flowers and pollen during the spring, fruit in summer and nuts, particularly hazel nuts where available, in autumn. Insects also supplement the diet throughout the year. Dormice are known to hibernate for as much as seven months of the year.

2.2 Population and distribution
The dormouse retains a widespread distribution across the southern counties of England where it is most numerous (figure 1), although it is always found in low densities. Total UK population is estimated at 45,000 individuals (Battersby, 2005). Its presence becomes more localised further north to the midlands. There are a few isolated populations in northern England. It is absent from Scotland and has been recorded in a few, widely separated areas across Wales.

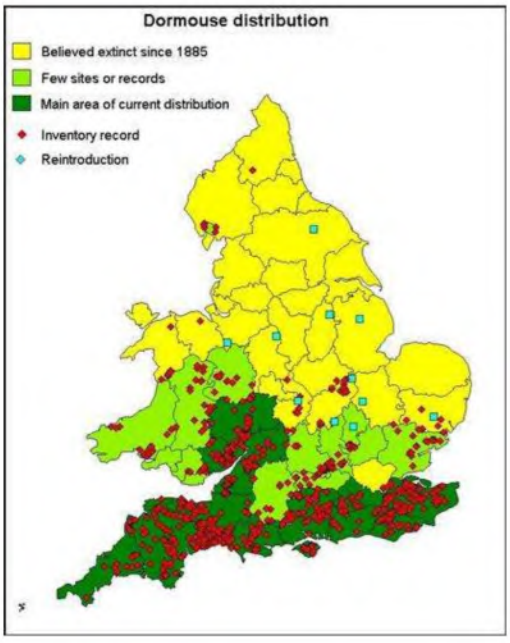

Figure 1. Dormouse distribution in England and Wales. Source: UK Biodiversity Partnership.

Records for dormouse in Worcestershire (figure 2) are localised and populations are mostly found on the western edge of the county throughout the Malvern Hills and then extending north into the Wyre Forest, most notably in The Betts reserve and Ribbesford Woods. There are scattered, occasional records from elsewhere in the county but for the most part these records are old and it is generally accepted that there are now no known dormouse populations east of the River Severn.

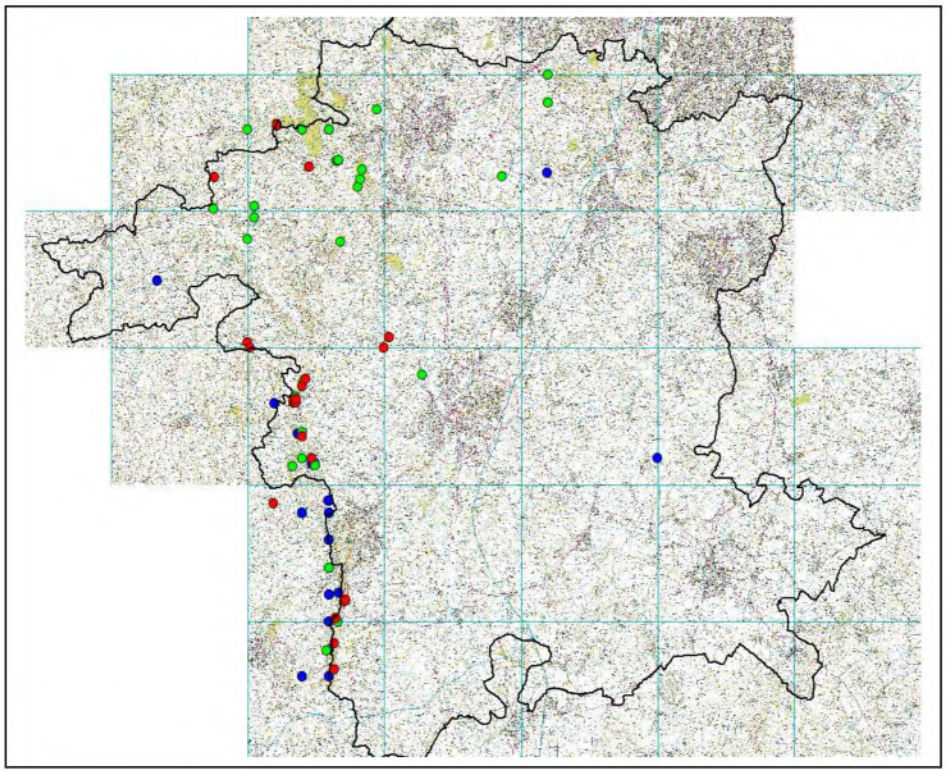

Figure 2. Records for dormouse in Worcestershire to 2007. Records pre-1979 are shown blue, 1980-1999 shown green and 2000-2007 shown red. Data provided by Worcestershire Biological Records Centre. *Note some data is displayed at hectad or tetrad level.*

2.3 Legislation

The dormouse is listed on Appendix lll of the Bern Convention and Annex IV of the EC Habitats Directive. It is protected under Schedules 5 and 6 of the Wildlife and Countryside Act 1981.

2.4 Summary of important sites

Worcestershire Wildlife Trust nature reserves:

- Monkwood is a 61 ha ancient woodland located approximately 6 miles NW of Worcester. The smaller southern part of the wood is jointly owned with Butterfly Conservation.
- The Knapp and Papermill is a 27 ha ancient woodland, meadow and orchard complex located in the valley of the Leigh Brook near Alfrick.
- The Betts is a 2.3 ha woodland situated on steep slope running down to the Lem Brook within the Wyre Forest.

Ribbesford Woods in the north of the county comprises 90 ha of predominately coniferous woodland planted in the 1970s. It lies one mile south east of the Wyre

Forest but has lost its physical connection due to the Bewdley bypass built in the late 1980s. It is also isolated to the east by the River Severn. The woodland is owned and managed by the Forestry Commission. The wood itself has no legal protection with only Gladder Brook on the southern edge of the wood designated a SSSI.

The **Malvern Hills** were designated an AONB in 1959, comprising a total of 105 square kilometres. It is unique for containing a wide variety of landscapes in a small area: 10 different landscape character types are recognised ranging from the high hills and slopes of the main ridge of the hills to the relatively flat, enclosed and unenclosed commons, which lie to the east and south-east. The north of the AONB is dominated by densely wooded, interlocking areas of ancient, semi-natural woodland. Land within the AONB is managed by a variety of individuals and bodies, ranging from the Malvern Hills Conservators - a public body established by Act of Parliament - to large private estates and small community Trusts. The AONB Partnership provides a broad framework for the care of the area and supports all those bodies that are involved in looking after it.

Ankerdine Common
Ankerdine Common is a 15-acre Local Nature Reserve of steep oak woodland between Knightwick and Martley. The site has one historical dormouse record from 1983, and some more recent records of dormice found nearby. Based on this, 50 tubes were put up on the reserve in June 2006 in areas selected as being more likely to support dormice to determine presence/likely absence. One dormouse nest was subsequently found in a tube and so further survey work is planned to begin to determine population size and distribution.

3. Current factors affecting the species

- The changing climate may be affecting hibernation patterns and availability/timing of food supply.
- Woodland management for other species can be inappropriate for dormice.
- Habitat fragmentation leading to population isolation.
- Lack of species rich woodland and linking hedgerow networks due to a lack of or inappropriate management.
- Rising deer population in some woodlands causing change in habitat structure.
- Insufficient knowledge of the species and lack of data regarding distribution beyond the main study sites.
- Possibility of competition from *Sciurus carolinensis* grey squirrel and other small rodent species for food and for hibernation and breeding sites.

4. Current Action

4.1 Local protection

There are no sites in Worcestershire protected specifically for their dormouse populations. Many of the sites where dormouse are found have designations for other reasons: Monkwood and the Knapp and Papermill nature reserves are both SSSIs, The Betts reserve falls within the Wyre Forest SSSI and many of the important sites on the Malvern Hills fall within the AONB, although most are privately owned. Ribbesford Woods currently has no protection.

4.2 Site management and programmes of action

Worcestershire Wildlife Trust

All reserves containing woodland and scrub are informally checked for dormice and when coppicing is carried out on occupied sites it is done in a dormouse friendly manner:

- Management of Monkwood is on 7 year and 20 year coppice plot rotations together with ride widening. Glades are also being opened up in areas containing dormouse boxes.
- Coppicing of ride sides is carried out at the Knapp and Papermill.
- At The Betts reserve small-scale coppicing is underway with a long-term plan to remove some of the mature trees to let in more light. All management is directed at providing better dormouse habitat.

Ribbesford Woods

Since 2000 the Forestry Commission Research department has been heavily involved in an in depth dormouse study in Ribbesford Woods, including radio tracking and micro-chipping. The projects initial aim was to "devise various methods of thinning conifers that sustain the local dormouse population in the short and medium term". This has now altered quite dramatically due to the government's decision on PAWS (Planted Ancient Woodland Sites) reversion. Wyre Forest has come out as a high priority for reversion and the projects main aim is now to find out the "best method of reverting coniferous plantations back to native broadleaves, while maintaining dormice populations".

During 2002 and 2003, 325 dormouse boxes were installed in the 17 ha research area within Ribbesford Woods. All animals subsequently found weighing above 12g were micro-chipped to follow their movements prior to, during and after thinning operations. There are also 225 boxes throughout the rest of the woodland to compare populations and movements.

In the autumn and winter of 2003/04 four experimental thinning operations were carried out in the research area:

- **Treatment 1** - (Hand cut with chainsaws and forwarder extraction - autumn) Small areas of conifers were felled (approximately 20mx20m) to create small glades within the crop. The idea being that these would regenerate naturally in years to come and would provide viable habitat for dormice by the time of the next operations in 5 years.

- **Treatment 2 -** (Harvester operation with forwarder extraction – winter) As treatment 1.

- **Treatment 3 -** (Harvester operation with forwarder extraction - autumn). Two larger areas of conifers were felled (approximately 0.3 Ha). This replicates the normal coppice plot size in the broadleaf scrub habitat, which dormice favour. Again this should regenerate naturally in years to come and would provide viable habitat for dormice by the time of the next operations in 5 years.

- **Treatment 4 -** (Harvester operation with forwarder extraction - winter) Normal thinning operation removing 30-35% according to standard thinning tables.

Monitoring of the dormouse population will continue in all areas beyond the next round of operations in 2008/09 when the above treatments types will be repeated until conifer reversion is complete.

Malvern Hills

Following on from the Dormice on the Malvern's Project 2006 (see section 4.3 below), the majority of landowners with survey sites on their land were provided with copies of Natural England's revised Dormouse Conservation Handbook and have been offered management advice on a one to one basis.

The Malvern Hills Conservators, who manage almost 3000 acres of the hills, have a management plan (currently for the 2006-2012 period) that states the need to take account of dormouse habitat requirements when managing the woodland and scrub on the slopes of the hills. The habitat requirements of the dormouse need to be carefully balanced with those of other species on the hills, notably *Vipera berus* adder, and there are plans to draw up a more detailed and specific scrub management plan to ensure that dormouse habitat is given adequate consideration.

4.3 Survey, research and monitoring

The National Dormouse Monitoring Programme (NDMP)

This programme is funded by Mammals Trust UK and Natural England with the aim of collecting long-term data about annual variation in timing and success of breeding from key dormouse sites around the country. It also monitors population density in different habitats and areas. Volunteers put up and monitor nestboxes and all of the information is collated centrally by the NDMP. Table 1 shows population trend data from 1993 to 2002.

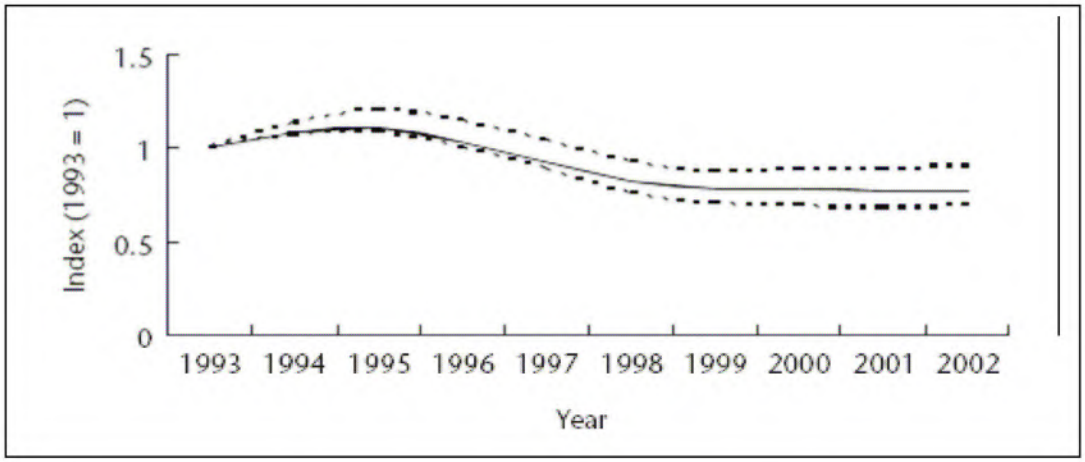

Table 1. The common dormouse in Great Britain. Population indices from the NDMP (1993-2002). Source: UK Mammals: Species Status and Population Trends, Tracking Mammals Partnership.

Great Nut Hunt

Mammals Trust UK launched the first Great Nut Hunt during National Dormouse Week in 1993 and the survey was subsequently repeated in 2001 by Mammals Trust UK and English Nature. In 1993 more than 330 dormice sites were identified, whilst in the 2001 survey this fell to only 136 sites. However, the 2001 survey resulted in 60 new dormice sites being recorded across the UK and 76 of the sites identified in 1993 were still occupied, showing that a number of dormice populations were managing to sustain themselves. Despite this, researchers

concluded that dormice had disappeared from more than half their historic range in the last century, with almost a 20% drop in the last decade. It is thought that dormice in the north of England are suffering the most, with almost a 50% downward trend.

Natural England has produced guidance documents on dormouse ecology and conservation, the most recent of which, The Dormouse Conservation Handbook, was published in 2006.

Forestry Commission
See details in section 4.2 above of the FC research and management programme in Ribbesford Woods. The research will continue to monitor the population dynamics of the resident dormouse population during PAWS restoration and survey data will be passed to the NDMP. Current best practise in relation to PAWS restoration is incorporated within Natural England's Dormouse Conservation Handbook.

Worcestershire Wildlife Trust
Nest box monitoring is ongoing at Monkwood and The Knapp & Papermill reserves. Monkwood has 50 boxes checked as part of the NDMP and more boxes are to be added. The Knapp & Papermill currently has 15 boxes that are checked informally. WWT intends to put up more boxes at The Knapp and Papermill and combine these into a survey unit along with the 25 boxes at the nearby Ravenshill Wood reserve and input the combined data for the two reserves into the NDMP.

Dormice on the Malvern's Project
In 2006, Herefordshire Action for Mammals initiated this project to carry out a survey of the Malvern Hills and establish current dormouse distribution. The project involved 13 current licence holders and around 35 members of the public who volunteered to take part in the survey following local publicity. The project therefore resulted in a high level of raised awareness amongst people in the local area. A total of 450 nest tubes were put up on 23 sites. At the end of the survey period in November, 17 confirmed dormouse nests had been found across 7 of the sites, and 8 live sightings of dormice had been recorded. More survey work and habitat creation is planned.

Ankerdine Common
Following the preliminary presence/absence survey in June 2006, in April 2007 90 tubes were put up within an (approximate) 20m x 20m grid on the main part of the Common in Worcestershire County Council ownership, with the aim of establishing, at a basic level, dormouse distribution on the Common. The tubes will be checked at least twice during the year and future survey plans will be made dependent on the outcome of this survey.

Worcestershire Recorders
Records for a Worcestershire Mammal Atlas are currently being collated and this is due for publication in 2008.

5. Associated Plans

Wet woodland, Woodland, Hedgerows, Veteran trees, Orchards, Scrub, Biological Recording.

6. Vision Statement

Existing dormouse populations throughout the county are maintained by the continuation of sympathetic management practices and monitoring techniques.

Our knowledge of dormouse population distribution within Worcestershire is improved by encouraging and training volunteers and land managers to take part in monitoring schemes.

Land managers are encouraged to consider dormice when carrying out operations by following available best practice guidance. In particular, the importance of creating and maintaining links between areas of appropriate habitat should be publicised and acted on.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Population	Train new volunteers and assist them in gaining a dormouse survey licence.	0	6	2012

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisation
WRC DOR AP 01	**1.1**	Establish Worcestershire Dormouse Group (WDG) made up of interested parties involved in local dormouse conservation work.	Worcestershire	2008	WCC-CS	FCE WWT MHC
WRC DOR AP 02	**1.1**	Establish email correspondence list for communication between those involved in dormouse conservation.	Worcestershire	2008	WCC-CS	
WRC DOR CA 01	**2.9**	Initiate annual event for those involved in dormouse conservation to incorporate a site visit/training session.	Worcestershire	2017	FCE	WDG*
WRC DOR CA 02	**2.15**	Develop and run two training and information sessions for landowners and professional conservation staff on best practice of combining PAWS restoration and dormouse conservation.	Ribbesford Wood	2012	FCE	WWT
WRC DOR CA 03	**2.15**	Train 6 survey volunteers and assist them with gaining a dormouse survey license.	Worcestershire	2012	FCE	WDG
WRC DOR CP 01	**3.11**	Update on Ribbesford Wood management and dormouse survey and monitoring results distributed to interested parties.	Worcestershire	2017	FCE	
WRC DOR CP 02	**3.13**	Secure funding for and produce a best practice leaflet guide for PAWS restoration whilst maintaining dormouse populations for distribution to local landowners.	Worcestershire	2010	FCE	
WRC DOR CP 03	**3.15**	Biodiversity Partnership dormouse information fact sheet to go on WDG partners websites or	Worcestershire	2008	WCC	WDG

		link to be created.				
WRC DOR CP 04	**3.16**	Initiate discussions with Natural England and highlight need to improve dormouse licensing renewal procedures.	England	2008	FCE	WWT
WRC DOR CP 05	**3.5**	Publicise need for dormouse records and volunteers to assist with surveying in local media and key local publications.	Worcestershire	2017	WWT	WDG
WRC DOR CP 06	**3.15**	Online article requesting dormouse records and survey volunteers.	Worcestershire	2008	WWT	
WRC DOR CP 07	**3.5**	Publicity to encourage public involvement in national monitoring schemes as they are announced.	Worcestershire	2017	WCC-CS	
WRC DOR CP 08	**3.11**	Annual publication of results for Malvern Hills survey work including submission of data to NDMP.	Worcestershire	2017	WCC-CS	
WRC DOR HS 01	**6.1**	Maintain current standards of woodland and scrub management and dormouse monitoring at sites with known dormouse populations.	Ribbesford Wood	2017	FCE	
WRC DOR HS 02	**6.1**	Maintain current standards of woodland and scrub management and dormouse monitoring at sites with known dormouse populations.	Monkwood, Knapp and Papermill, The Betts	2017	WWT	
WRC DOR HS 03	**6.1**	Establish an appropriate scrub management regime that takes account of dormouse habitat requirements.	Malvern Hills	2008	MHC	
WRC DOR HS 04	**6.15**	Examination of historical dormouse records to determine likely sites for re-surveying.	Worcestershire	2008	WWT	WDG
WRC DOR ID 01	**8.2**	Contribute data annually to Worcestershire Biological Records Centre and National Dormouse Monitoring Programme.	Worcestershire	2017	WCC WWT FCE	
WRC DOR SM 01	**12.15**	Erect 50 nestboxes.	Ribbesford Wood	2008	FCE	
WRC DOR SU 01	**13.2**	Likely sites visited and habitat condition assessment carried out to produce priority site list for dormouse survey.	Worcestershire	2009	WWT	WDG

WRC DOR SU 02	**13.6**	Article for Worcestershire Record about historical dormouse records and requesting volunteer support to re-survey sites.	Worcestershire	2008	WWT	WR
WRC DOR SU 03	**13.4**	Initiate dormouse nest box monitoring scheme by erecting 50 boxes in locations where dormouse presence was confirmed in 2006 survey and/or suitable potential habitat was identified.	East side of Malvern Hills	2008	WCC-CS	WWT MHC
WRC DOR SU 04	**13.4**	Continue dormouse nest tube surveys annually on key sites.	East side of Malvern Hills	2017	MHC	

FCE – Forestry Commission England **WWT** – Worcestershire Wildlife Trust **WR** – Worcestershire Recorders
MHC – Malvern Hills Conservators **WCC** – Worcestershire County Council **WDG** – Worcestershire Dormouse Group

* WDG (Worcestershire Dormouse Group) will be established as a task group of organisations and individuals that have an interest in and / or play an active role in Dormouse conservation within the county.

References and further information

Dormice on the Malvern's 2006. Survey report published by Herefordshire Action for Mammals.

The Dormouse Conservation Handbook, Natural England.

Tracking Mammals Partnership (2005). *UK Mammals: Species Status And Population Trends.* Edited and complied by Battersby, J. JNCC / Tracking Mammals Partnership. www.trackingmammals.org

Bats
Species Action Plan

1. Introduction

Bat species in the UK are nocturnal mammals, all of which predate exclusively on insects. These highly adaptable mammals occur throughout Worcestershire, and readily exploit both man-made and semi-natural habitats. All species of bat in the UK are protected by both UK and European legislation. This Species Action Plan is a combined plan for all the bat species that occur in Worcestershire (table 1).

2. Current Status

2.1 Ecology and habitat requirements

Bats are highly evolved, long-lived (up to 30 years in the wild) sociable mammals, and are well adapted to the UK's climate and its range of habitats. All UK bat species have evolved as nocturnal feeders. This strategy allows them to avoid competing for food resources with other species such as birds, and allows them to steer clear of many potential predators.

Contrary to popular myth, bats are not blind and do in fact have excellent low-level light eyesight. However, in order to hunt effectively at night, bats have evolved a sophisticated sonar system called 'echo-location'. This echo-location system allows bats to build up a 'sound image' of their immediate environment. The bat creates this sound image by producing a series of high-pitched ultra-sonic calls inaudible to the human ear. The bat then quickly analyses the returning echoes and uses this information to navigate and locate its prey. So highly developed is this system that bats can detect and predate even small flying insects in total darkness.

Mating generally occurs in autumn, sometimes continuing into the winter months (weather dependant), but the female bat does not become pregnant until spring, post hibernation. After mating, the female stores the sperm until conditions become favourable, at which point an egg is released and is fertilised. Females generally have one pup, occasionally two, and these are born between June and early August. The pup's growth is rapid and they will be weaned, able to fly and feed for themselves about 45-65 days after birth (Altringham, 2003). While males tend to spend the summer alone or in small groups, females tend to form larger maternity colonies. These can range in size from 10-200 individuals; although in some species can be many times that. Despite the differences in roost choice from species to species their basic requirements are the same. The roost must provide the required micro-climate to minimise energy loss through body temperature regulation and to successfully rear the young. The roost must also be close to suitable foraging habitats and provide protection from potential predators.

In order to cope with scarce food supply and cold temperatures in the winter months, bats have evolved the ability to enter a state known as 'torpor'. In order to go into torpor, bats lower their metabolic rate and body temperature to that of their surroundings to reduce energy consumption. Bats can then spend most of the winter months hibernating in this state, only waking to feed on mild nights.

This strategy can also be employed in the summer months in prolonged periods of poor weather.

Species	Status	Biodiversity Action Plan status
Barbastelle *Barbastella barbastellus*	Rare	UK BAP, LBAP
Bechstein's bat *Myotis Bechsteinii*	Very rare.	UK BAP, LBAP
Brandt's bat *Myotis brandti*	Very rare.	LBAP
Brown Long-eared bat *Plecotus auritus*	Widespread, common.	UK BAP, LBAP
Daubenton's bat *Myotis daubentonii*	Widespread.	LBAP
Leisler's bat *Nyctalus leisleri*	Uncommon.	LBAP
Lesser horseshoe bat *Rhindophus hipposideros*	Uncommon	UK BAP, LBAP
Natterer's bat *Myotis nattereri*	Uncommon	LBAP
Noctule bat *Nyctalus noctula*	Widespread	UK BAP, LBAP
Serotine *Eptesicus serotinus*	Rare	LBAP
Common Pipistrelle *Pipistrellus pipistrellus*	Widespread, common	LBAP
Soprano Pipistrelle *Pipistrellus pymaeus*	Widespread, common	UK BAP, LBAP
Nathusius Pipistrelle *Pipistrellus nathusii*	Rare	LBAP
Whiskered bat *Myotis mystacinus*	Uncommon, widespread.	LBAP

Table 1: Bat species occurring in Worcestershire (data provided by Worcestershire Biological Records Centre).

2.2 Population and distribution

Little is known about the current status of most bat species in Worcestershire, and a countywide survey has yet to be carried out. Available evidence from the Bat Conservation Trust's National Bat Monitoring Programme UK wide survey data (1997-2005) suggests stability in populations of most species and significant positive trends in lesser horseshoe (Hibernation & Colony Count Surveys), Daubenton's (Hibernation Survey), natterer's (Hibernation Survey) and common pipistrelle (Field Survey).

14 of the 17 UK bat species (table 1) have been recorded in the County. However, only three species, common pipistrelle, soprano pipistrelle and brown long-eared are considered to be common. Figure 2 shows the current combined distribution of all of Worcestershire's bat species, and indicates that bats are widespread throughout the County. However, bat species in the County are generally under-recorded and therefore current records cannot represent their true range and distribution. Until a more co-ordinated and systematic countywide survey is undertaken, bat distribution in Worcestershire will not be adequately understood.

Some bat species such as Brandt,s and whiskered have very similar physical characteristics and echo-location calls. These similarities make it very difficult to distinguish between the two species, either in the hand or through sound analysis, which can lead to miss-identification. This is possibly the reason why the first record of Brandt's was only confirmed in the county this year (2007).

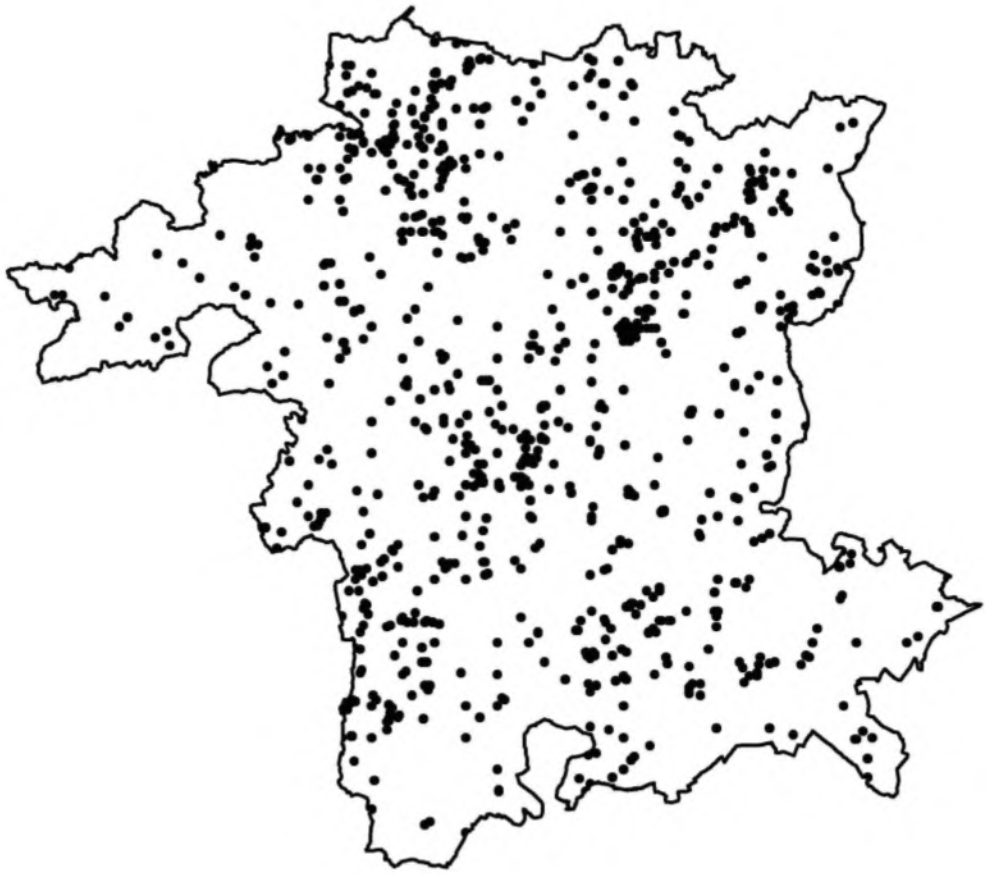

Figure 2: Known bat distribution in Worcestershire (data provided by Worcestershire Biological Records Centre). ***Note some data is displayed at hectad or tetrad level.***

2.3 Legislation

All species of bat in the UK are protected by European and national legislation (table 3). In England, bats are afforded protection under both the Conservation (Natural Habitats, &c.) Regulations (1994) (as amended) and the Wildlife and Countryside Act 1981 (as amended). This legislation protects the breeding site/resting place of bats and the animals themselves (or any part thereof). It also protects them against deliberate disturbance, capture and killing. Any activities that would result in any of the above actions would need to be carried out under licence from Natural England.

Table 3: Legislation protecting bats in Europe and England.

European	National
• The Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1982) • Agreement on the Conservation of Bats in Europe (1992) (Under the Bonn Convention on the Conservation of Migratory Species of Wild Animals) • EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora. (1992)	• Wildlife and Countryside Act 1981 (as amended) • The Conservation (Natural Habitats, &c.) Regulations (1994) (as amended). • Natural Environment and Rural Communities (NERC) Act 2006, (places a duty on public bodies to have regard for biodiversity)

As well as the legislation, protected species and biodiversity in general are also safeguarded in the planning system through specific planning policy. Planning Policy Statement 9: Biodiversity and Geological Conservation (PPS9) states that '*the aim of planning decisions should be to prevent harm to biodiversity and geological conservation interest*' and that '*planning decisions should aim to maintain and enhance, restore or add to biodiversity and geological conservation interests'*. PPS9 also states "*if significant harm cannot be prevented, adequately mitigated against, or compensated for then planning permission should be refused*".

In addition, the ODPM Circular 06/2005 "Biodiversity and Geological Conservation - Statutory Obligations and their Impact within the Planning System" that accompanied PPS9 states that when considering a planning application *"The presence of a protected species is a material consideration,'* and that the *'presence or otherwise of protected species… is established before the planning permission is granted'*. Both of these policies underline the fact that planning decisions should be based on the relevant survey information gained prior to a planning decision and that the planning decision should not only seek to conserve any biodiversity interest but also to enhance it as a result of the development.

2.4 Summery of important sites in Worcestershire

Relatively little is known about where sites of county importance for bats are located within Worcestershire. However, we can be pretty certain about broad areas of the County that are of high importance to bats. These areas tend to be what is considered 'old countryside' and are generally characterised by large areas of semi natural habitat, well-connected mosaics of smaller areas of semi-natural habitats or a mixture of both. These characteristics mean that these areas contain diverse invertebrate-rich foraging habitats, a strong wildlife corridor network, much of which is ancient, and large amounts of potential roosting habitat for both summer roosting and hibernation.

Wyre Forest

The Wyre Forest is one of the largest areas of woodland in Britain covering 2,636ha. Virtually half of this vast area is ancient semi-natural (ASN) and half ancient replanted. The Wyre Forest is nationally important and most of it is designated as NNR, SSSI or SWS. As well as woodland, the Wyre holds a mosaic of semi-natural habitats including valuable areas of heathland, unimproved/semi-improved species-rich grasslands (acid and mesotrophic), traditional orchards and wetland.

Severn Valley – Teme Valley

The area between the Severn Valley and the Teme Valley, centred on the parishes of Kenswick, Wichenford, Martley, Great Witley and Little Witley, is considered to be an area of high importance for bats. This area was highlighted during Worcestershire County Council's development of ecological profiles for its Landscape Character Assessment Project.

The area holds a very significant ASN woodland resource, and has a high number of very small ASN woodlands, many of which are too small (<2ha) to appear on the Ancient Woodland inventory. The area also has a high veteran tree resource associated with the ancient woodland, areas of wood pasture and the

area's relatively intact ancient hedgerow system. The area also holds excellent foraging habitat including many traditional orchards, areas of unimproved/semi-improved species-rich grasslands and biologically rich road verges, all of which connect via a comparatively intact ancient hedgerow system.

Teme Valley
The Teme valley contains significant areas of ASN woodland. These tend to be associated with dingle woodlands and incised stream valleys, which contain species-rich wetland habitats. The Teme Valley also contains significant areas of traditional orchard and old grassland. Many of these habitats are connected via a strong network of wildlife corridors associated with ancient hedgerows and the highway/byway network. This rich mosaic of well connected habitats make the Teme Valley a particularly important area for bats.

Malvern Hills
The Malvern Hills is an area of old countryside that contains large areas of semi-natural habitats, and has a strong well connected wildlife corridor network. There are significant areas of ASN woodland flanking the hills and the rich geodiversity of the area has created a mix of woodland types. On the Malverns themselves there is moderate woodland cover, in large part due to recent natural regeneration.

The Malvern Hills holds large areas of nationally significant unimproved grassland communities. The majority of this grassland is acidic with locally dominant areas of bracken. However, the diverse geology of the area has given rise to areas of calcareous and mesotrophic grassland types. As well as grassland and woodland, the Malvern Hills and its surrounds also contain areas of heathland, wetland and traditional orchards. The area also contains many ancient species-rich hedgerows and a high veteran tree interest often associated with the highway/byway networks. Many of these species-rich hedgerows were derived from woodlands, often representing original woodland boundaries.

3. Current factors affecting bat species in Worcestershire

Loss of corridor habitat
UK bat species have adapted to foraging in a complex landscape, within a mosaic of habitats (woodland, grassland, open/running water, hedgerows and scrub) rich in invertebrates. Within the landscape bats use linear habitats such as hedgerows and watercourses to navigate through the countryside from their roost sites to suitably insect-rich foraging habitats. However, during the second half of the 20th century this type of high quality corridor habitat became increasingly rare and fragmented within the county, and the UK as a whole. With the push to improve agricultural productivity hedgerow removal was a common practice in an effort to enlarge fields and allow the use of larger machinery. Of the hedgerows that remain, many have become degraded, defunct and sterile through a process of over-cutting, spray drift and close ploughing.

Like hedgerows, watercourses have also been affected by agricultural intensification. Watercourses have suffered through a combination of defuse agricultural pollution and bank modification, the results of which have led to a reduction in vegetation structure and diversity and a general reduction in invertebrate abundance and diversity.

As a consequence of bats' dependence on corridor habitat for navigation, its removal can have a significant negative effect. When these flight-lines are removed, either in a single event or over a long period of unsympathetic management, it has the effect of isolating bat colonies away from suitable food sources. Over a long period of time this process of habitat fragmentation and isolation has led to serious declines in local bat populations, affecting more specialist species the greatest.

Loss of insect-rich habitats

Habitat modification/simplification has occurred across much of Worcestershire's semi-natural habitats and in turn has had a negative impact on bat populations/species distribution in the county. Many of Worcestershire's past ancient woodland sites have been clear felled and either replaced by intensive farmland or by non-native coniferous plantations. These plantations are quite often a monoculture of non-native species and are therefore unable to offer the roosting habitat associated with old/veteran trees, or to support the rich invertebrate assemblages that its broadleaf predecessor did.

Grasslands have suffered a similar fate; many unimproved grasslands rich in flora and fauna have been ploughed-up either for arable use, or to be re-seeded with more productive and less diverse grass species. Of the remaining unploughed grasslands many have been agriculturally improved through a combination of overgrazing, chemical fertilisers and herbicides or left to scrub over. This change in management intensity has drastically reduced the biological diversity of many grassland sites and in turn their suitability as quality bat foraging habitat.

Loss of summer roost sites

High-quality roost sites are as important to bats as high-quality foraging habitat. Bats will roost in a whole host of habitats and structures and these will differ from species to species. Potential roost sites can include damaged or veteran trees, barns, churches, bridges, old and new buildings of all types, and in many cases people's homes. Bats have in the past suffered, and continue to suffer, from poor public relations. Many people see bats as a costly pest, particularly when roosting in the home and as a result bats have, and do, suffer from persecution.

Whether it is intentional or though ignorance, many bat roosts have been destroyed or sealed up during demolition and/or renovation works. The re-use of agricultural buildings for residential purposes is another factor affecting bat roosts, especially since the recent (late nineties) boom in house prices. This increase in barn conversions has almost certainty had a negative impact on some bat species. Whilst some of these developments do carry out surveys and take protected species into account prior to gaining planning permission, there are still many that do not.

The planning policy in place to protect bats, i.e. PPS9 and its accompanying circular, relies on the willingness of the relevant Planning Authority to implement it. Furthermore, the Planning Authority must have the ability firstly to recognise when a development might affect bats and if so request the relevant survey information, secondly to have the knowledge and expertise to interpret ecological information, and finally to implement the relevant measure to safeguard bats. If a Planning Authority fails on any of the above points, then bats and biodiversity in

general are failed by the planning system. Currently in Worcestershire this is often the case.

The application of timber treatment chemicals such as Dieldrin, Lindane etc to control wood-boring pests has also had a detrimental effect on bat roosts. These highly toxic chemicals are easily absorbed through the bat's skin and have been responsible for poisoning many bat roosts. Although some of these chemicals have now been withdrawn from sale because of the danger they present to humans, many others are still in use and pose a direct threat to some bat species if used carelessly. There are now more bat-friendly timber treatments on the market but these tend to be more expensive, and can still poison bats if directly sprayed onto the animal.

Although many bat species have adapted to using man-made structures, some species like barbastelle and Bechstein's generally have not. These species rely on natural roost structures (splits, tears, holes) in damaged or veteran trees. However, during the last century very mature and veteran trees have decreased in number throughout the landscape due to a whole host of causes. For example, many of our existing broadleaf woodlands were asset-stripped during the 1st and 2nd World Wars, and modern forestry practices have both selected out characteristics associated with veteran trees such as epicormic growth, and will actively remove damaged or diseased trees. Furthermore, many very mature and veteran trees in open countryside have either died prematurely due to close ploughing, have been felled for health and safety reasons, or have been removed in an over zealous attempt to tidy up the countryside. Consequently, very mature and veteran trees are not all that common in the countryside, and it is no coincidence that bat species that rely on this habitat have also declined in numbers and are now amongst the UK's rarest bat species.

Loss of hibernation sites

High quality and secure hibernation roosts are relatively rare and tend to attract high numbers of hibernating bats. As a result, the loss of a single roost site can have a significant negative impact on bat populations in a given area. Bat species that have in the past relied on natural underground structures such as caves have become well adapted to using man-made structures such as mines, disused railway tunnels, canal tunnels, cellars and ice houses. However, it is important that these sites remain secure to prevent disturbance and are maintained in a sympathetic manner so not to inadvertently seal bats in or disturb them during maintenance work.

Bats are extremely vulnerable when hibernating and disturbance through factors such as tourism pressure (caving), deliberate vandalism or through curiosity can have severe consequences for the hibernating bats. Hibernating bats may take 30 minutes or more to arouse from torpor and escape from danger (Altringham, 2003). If bats are disturbed during the winter months and do arouse from torpor, then this will use up vital energy reserves which may prevent the disturbed bats surviving the winter.

4. Current Action

Worcestershire Bat Group

The recently reformed (2006) Worcestershire Bat Group (WBG) has been undertaking roost counts, running bat detector training courses, holding lectures

and carrying out bat walks for both bat group members and members of the public. The bat group is currently carrying out an audit of known sites of county importance in order to work up an annual monitoring programme for the WBG to undertake.

Bat Conservation Trust – National Bat Monitoring Programme surveys
The Bat Conservation Trust coordinate numerous surveys within Worcestershire that are all carried out by volunteers; these include field surveys, watercourse surveys, summer roost counts and hibernation counts.

Vincent Wildlife Trust
The Vincent Wildlife Trust is currently undertaking bat box surveys in woodlands along the Malvern Hills.

5. Associated Plans

Woodland, Wet woodland, Semi-Natural Grassland, Lowland Heathland, Veteran Trees, Ancient/Species-rich Hedgerows, Traditional Orchards, Rivers and Streams, Ponds and Lakes, Canals, Urban.

6. Vision Statement

That the distribution of bat species in Worcestershire is understood and regularly updated through research and submission of records, and this knowledge is used by environmental professionals and land managers to inform good site management. Appropriate surveys and up to date species data is used by local authorities to inform planning decisions in order to protect and enhance the environment for bats in Worcestershire. The WBG leads a team of volunteers and licensed bat workers, taught by licensed trainers within the county, to collect and submit bat records to the WBRC, give advice to householders and landowners on bat legislation and conservation, raise the profile of bats through talks and event, and carry out surveys and research.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Range	Obtain bat survey information from 80% of 1km squares in Worcestershire (1390 of the 1737 1km squares that comprise Worcestershire).	27% (474 1km squares)	80% (1390 1km squares)	2015
Population	Increase the number of bat license trainers working in the County.	0	2	2015
Population	Increase the number of volunteer bat workers working in the County.	8	20	2015

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC BAT CA 01	**2.11**	Produce a leaflet to inform those involved in planning and executing building work on ancient buildings, barns, churches and farm buildings of the legislation protecting bats and how to include bat conservation and enhancement in their development.	Worcestershire	2010	WBG	WWT WCC NE
WRC BAT CA 02	**2.11**	Ensure advice and support is readily available to owners of roost sites, especially to those with roosts inside their homes.	Worcestershire	2017	WBG	NE WCC WWT
WRC BAT CA 03	**2.15**	Train 12 licensed volunteer bat workers.	Worcestershire	2015	WBG	NE
WRC BAT CA 04	**2.15**	Run training events for volunteers to help develop field survey expertise using bat detectors.	Worcestershire	2017	WBG	WCC BCT NE
WRC BAT CP 01	**3.15**	Develop and maintain an annual programme of publicity, advice and education to ensure public awareness of the status and needs of bats.	Worcestershire	2017	WBG	WCC NE
WRC BAT FR 01	4.13	Establish two licensed volunteer bat worker trainers within the County.	Worcestershire	2015	WBG	NE

WRC BAT ID 01	**8.1**	Support the BCT's NBMP surveys in Worcestershire, and ensure that all records are forwarded to the WBRC to facilitate local data distribution.	Worcestershire	2017	WBG	
WRC BAT PL 01	**9.8**	Advise Local Authorities on the development of policies and protocols that will ensure all relevant departments consider the needs of bats at an early stage when carrying out work that may affect them. This includes road/bridge/tunnel construction and maintenance, tree work, work on or near watercourses and all types of building work.	Worcestershire	2017	WCC	WWT WBG NE
WRC BAT SU 01	**13.4**	Implement or improve the effectiveness of current post-development monitoring of planning applications that have affected bat roosts.	Worcestershire	2010	All District Councils	
WRC BAT SU 02	**13.4**	Worcestershire Bat Group to undertake an audit by 2010 of existing data relating to roost sites and instigate annual monitoring of roost sites considered of county importance.	Worcestershire	2010	WBG	NE
WRC BAT SU 03	**13.2**	Carry out an audit and subsequent survey of all known icehouses in Worcestershire.	Worcestershire	2015	WBG	WCC
WRC BAT SU 04	**13.2**	Carry out bat activity surveys on 40 WWT reserves in 2008. Surveys to be carried out by WBG and other volunteers to celebrate 40 years of the WWT.	Worcestershire	2009	WBG	WWT
WRC BAT SU 05	**13.2**	Initiate a series of countywide bat surveys undertaken by volunteers, in order to determine the status and distribution of each species in Worcestershire.	Worcestershire	2015	WBG	NE WCC

BCT - Bat Conservation Trust
FCE - Forestry Commission England
NE - Natural England
FWAG - Farming & Wildlife Advisory Group
WCC - Worcestershire County Council
WBG - Worcestershire Bat Group
WWT - Worcestershire Wildlife Trust
WDC – Wychavon District Council
RBC – Redditch Borough Council
WorcsCC – Worcester City Council
BDC – Bromsgrove District Council
WFDC – Wyre Forest District Council
WBRC - Worcestershire Biological Records Centre
MHDC – Malvern Hills District Council

References and further information

Altringham, J, (2003). *British Bats*. New Naturalist 93, Harper Collins.

Bat Conservation Trust, including National Bat Monitoring Programme data - www.bats.org.uk

Mitchell-Jones A.J. and Schofield H.W, (2004). *The Bats of Britain & Ireland.* Vincent Wildlife Trust.

Mitchell-Jones A.J (2004). *Bat Mitigation Guidelines.* English Nature.
http://naturalengland.communisis.com/NaturalEnglandShop/default.aspx

Mitchell-Jones, A.J, & McLeish, A.P. Ed, (2004). *3rd Edition Bat Workers' Manual*. JNCC. http://www.jncc.gov.uk/default.aspx?page=2861

Vincent Wildlife Trust - http://www.vwt.org.uk/

Worcestershire Biological Records Centre – www.wbrc.org.uk

Water Vole
Arvicola terrestris
Species Action Plan

1. Introduction
The water vole is the UK's fastest declining mammal and a priority UK BAP species. Formerly common throughout Britain, studies have shown a considerable decline in numbers in recent times, a trend reflected in Worcestershire.

2. Current Status
2.1 Ecology and Habitat Requirements
Key Habitats:
- The fringe of densely vegetated rivers, streams, canals and ditches
- Ponds, lakes and marshes

Water voles are aquatic mammals that inhabit the banks of rivers, canals, ditches, pools and marshes. They live in a network of burrows within the banks, having territories along the water's edge marked by the presence of latrines. They feed on bankside and marginal vegetation including grasses, sedges, rushes and reeds. These plants also provide cover to protect them from numerous predators such as *Mustela vison* American mink, *Lutra lutra* otter, *Tyto alba* barn owl, *Mustela erminea* stoat and domestic cats. Breeding occurs from April to August and they can produce up to five litters, each containing three to four young.

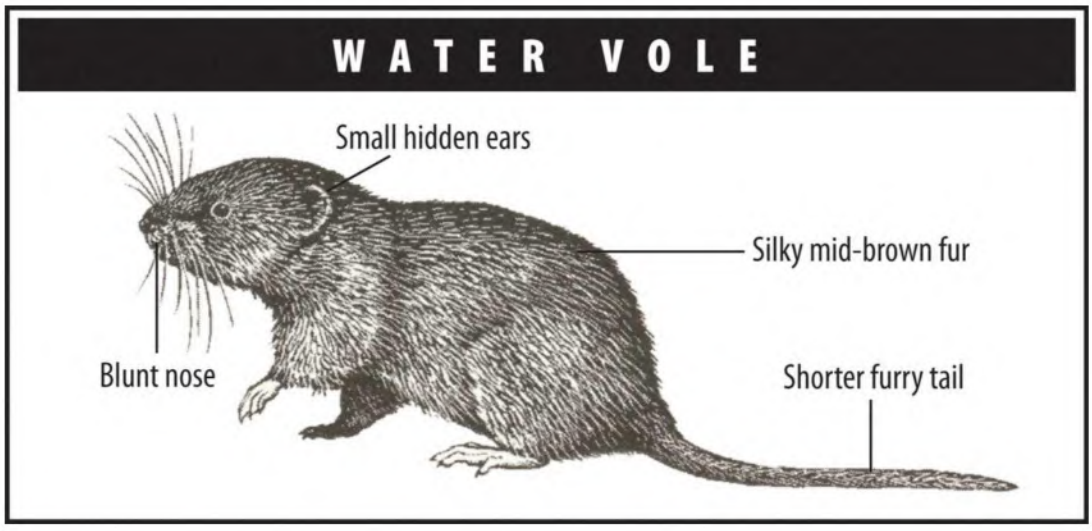

Figure 1. Key features distinguishing the water vole from *Rattus norvegicus* brown rat, for which it is often mistaken.

2.2 Population and Distribution
Water voles are found throughout Britain, mainly in lowland areas. However, they are increasingly being sighted in upland sites, urban areas and isolated pools. This change in behaviour and the occupation of sites at the extreme of their habitat requirements is thought to be mainly attributable to predation by the American mink.

The Vincent Wildlife Trust carried out national water vole surveys in 1989-90 and 1996-98. These surveys show a long-term decline in water vole numbers since 1900, with a dramatic decline through the 1990's. In the Severn Trent area water vole numbers have declined by 90% between 1990 and 1998. This makes the water vole Britain's fastest declining mammal and therefore a priority species for conservation action in the UK Biodiversity Programme.

In Worcestershire the population shows a similar trend. Figure 2 shows all water vole records currently held for the county but the majority are historical and no longer believed to be current: a countywide survey carried out by Worcestershire Wildlife Trust in 2000 found water voles only in the Bromsgrove District. These are believed to be the last populations of water voles in Worcestershire, with populations on the Worcester and Birmingham canal and the streams and ditches within Bromsgrove town itself. In 2002 Worcestershire Wildlife Trust surveyed thirty-two sites in Bromsgrove. Eleven sites (approx. 34%) showed positive signs of water vole activity. Compared with the national survey, which only found signs on 14% of the surveyed sites, this stresses the importance of the population in Bromsgrove.

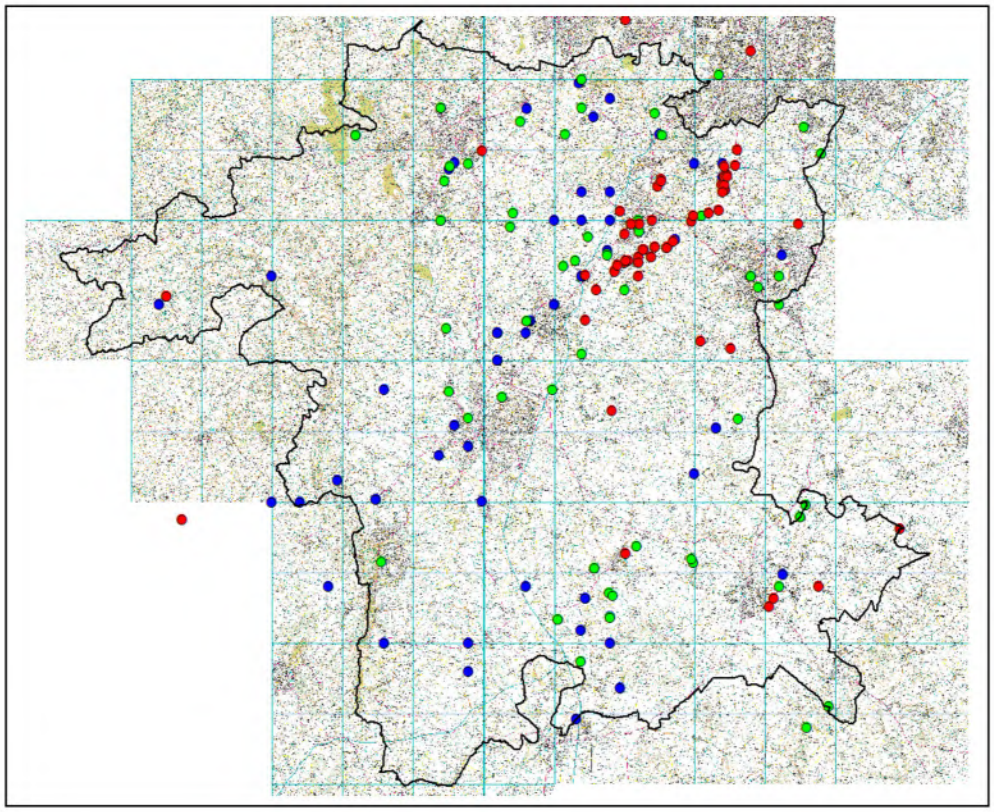

Figure 2. Water vole records in Worcestershire to 2007. Records pre-1979 are shown blue, 1980-1999 shown green and 2000-2007 shown red. Data provided by Worcestershire Biological Records Centre. *Note some data is displayed at hectad or tetrad level.*

2.3 Legislation

The water vole is listed in schedule 5 of the Wildlife and Countryside Act 1981. In April 2008 the protection it receives under the Act was upgraded and it is now an offence to intentionally or recklessly:

- Kill, injure, or take, possess, or trade in water voles

- Damage, destroy or obstruct access to any structure or place which water voles use for shelter or protection.
- Disturb water voles whilst they are using such a place.

Lawful and essential operations affecting water vole habitat must take full account of this protected status and avoidance of damage/adequate mitigation must be undertaken.

Under the Water Act 1989, it is an offence to cause or knowingly permit a discharge of poisonous, noxious or polluting matter to enter any controlled waters without proper authority.

2.4 Summary of important sites

The canal and stream system through and around Bromsgrove in the north east of the county is collectively the most important area for water voles in Worcestershire.

3. Current Factors Affecting the Species

The main three reasons for decline are:

- **Predation by American mink:**
  UK water voles are approximately 20% bigger than continental water voles and for this reason American mink are able to enter their burrows. A female mink with young is able to exterminate a water vole population within one or two years.

- **Habitat loss:**
  In the last hundred years we have lost the majority of our wetlands though draining and development, and many of our rivers have become inhospitable for wildlife though human modifications and insensitive bankside and channel management. Though increased awareness among the main riparian owners has led to improvements in some places, several types of habitat loss are still threatening water voles. These include:
  - Development on the floodplains of rivers leading to containment of river channels and loss of riparian habitat.
  - Intensive engineering, bank protection and maintenance work to rivers and canals often damages bankside habitat.
  - Intensive grazing by livestock causes poaching of banks and the destruction of burrows and bankside vegetation.
  - Inappropriate, intensive mowing of the bank and vegetation clearance results in water voles being increasingly vulnerable to predators.
  - Lack of management can lead to degradation of the waterside habitat through siltation, drying out or invasion by scrub.
  - Loss of ponds and the degrading of associated habitat through development and farming practices.

- **Population fragmentation:**
  Fragmentation of the population from habitat loss and degradation may accelerate the rate of local population decline. Isolated groups are more vulnerable to environmental change and extinction, and survival is enhanced if colonies are connected.

Other important threats are:

- Excessive fluctuations in water levels due to land drainage or flooding can damage riverbanks and burrows.
- Drought conditions can expose burrows making the water vole more vulnerable to predators.
- Poisoning by the use of rodenticides is a major threat in urban situations.

4. Current Action

4.1 Local protection

The Worcester and Birmingham Canal and the River Salwarpe are both County Special Wildlife Sites.

4.2 Site Management and Programmes of Action

- The Water Vole Conservation Handbook published by English Nature and the Environment Agency has recently been updated.
- Worcestershire Wildlife Trust has written a Water Vole Conservation Strategy for Bromsgrove District Council. Bromsgrove District Council has not yet implemented this strategy to any great extent.
- The Environment Agency takes the requirements of water voles into account in its capital and maintenance works and when carrying out its regulatory function of issuing consents. The promotion of soft bank engineering techniques is particularly beneficial to water voles.
- Similarly, British Waterways take the ecology and habitat requirements of water voles into account in canal maintenance works and actively pursue the use of soft bank engineering where appropriate.
- There are currently two boreholes in operation on the Battlefield Brook that aim to maintain and supplement baseflow. These boreholes are operated by Severn Trent Water and the Environment Agency, who hope that their use will help to maintain and expand existing water vole colonies.

4.3 Survey, research and monitoring

- County water vole records are collected by the Worcestershire Biological Records Centre and Worcestershire Wildlife Trust.
- The Worcestershire Wildlife Trust's countywide survey only recorded current signs of water vole activity in the Bromsgrove area.
- In 2002 Worcestershire Wildlife Trust carried out a water vole survey within Bromsgrove town, which informed the production of Bromsgrove District Council's Water Vole Conservation Strategy.
- A standard survey method for water voles is being developed by the National Pond Monitoring Network and will be available from their website.

5. Associated Plans

Rivers and Streams, Ponds and Lakes, Canals, Fen and Marsh, Otter.

6. Vision Statement

All known water vole populations being safe, secure and viable, with potential for expansion maximised as much as possible.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Range	Eradication of mink on all strategic watercourses within Bromsgrove District – Sugar, Battlefield and Spadesbourne Brooks (three sites) and the streams and ditches within Bromsgrove town (one site)	Mink present on all 4 sites	Mink present in none of these sites	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC WAV CA 01	**2.16**	Use the water vole as a 'flagship' species when carrying out publicity to highlight biodiversity issues within the District.	Bromsgrove District	2017	BDC	WWT
WRC WAV CP 01	**3.7**	Produce and erect appropriate interpretation and information signs to raise awareness of water vole conservation and to reduce impact of human disturbance.	Bromsgrove District	2009	BDC	WWT
WRC WAV HC 01	**7.4**	Prioritise sites requiring management or conservation action and develop strategy to create or restore habitat at five sites.	Worcestershire	2010	To be identified	
WRC WAV HC 02	**7.6**	Use the development control system to best effect to stop further fragmentation of water vole sites and where possible link up fragmented sites.	Bromsgrove District	2017	BDC	WWT BW
WRC WAV HS 01	**6.17**	Ensure that compensation boreholes on the Battlefield and Spadesbourne Brook are operated to maintain optimum water levels to protect and enhance water vole habitat.	Spadesbourne Brook Battlefield Brook	2017	EA	STW
WRC WAV SM 01	**12.3**	Produce 'environmental options map' to	Bromsgrove	2009	BDC	WWT

		ensure water vole friendly watercourse management, paying regard to dredging activities and protocols.	District			EA
WRC WAV SM 02	**12.1**	Improve bank side management of all strategic watercourses in Bromsgrove District to increase their suitability for water voles – Sugar, Battlefield and Spadesbourne Brooks and the streams and ditches within Bromsgrove town.	Bromsgrove District	2010	BDC	EA WWT
WRC WAV SM 03	**12.1**	Improve bank side management on the Worcester and Birmingham canal to increase their suitability for water voles.	Worcester and Birmingham canal	2010	BW	
WRC WAV SM 04	**12.11**	Produce and implement a strategy for the control of mink on strategic watercourses.	Bromsgrove District	2008	WWT	EA BDC BW
WRC WAV SM 05	**12.15**	Incorporate water vole habitat improvement into all projects and management work as appropriate.	Worcestershire	2017	EA WWT BW BDC	
WRC WAV SM 06	**12.11**	Eradicate Himalayan balsam on 75% of affected watercourses.	Bromsgrove District	2012	BW BDC	
WRC WAV SU 01	**13.5**	Review existing data and confirm timing and methodology for a programme of annual monitoring of water vole sites.	Worcestershire	2010	To be identified	
WRC WAV SU 02	**13.4**	Implement annual monitoring programme of water vole sites.	Bromsgrove District	2010	To be identified	
WRC WAV SU 03	**13.2**	Identify all physical obstructions (narrow culverts etc) between known colonies that contribute to habitat fragmentation.	Bromsgrove District	2010	To be identified	
WRC WAV SU 04	**13.4**	Monitor the results of the mink control programme on an annual basis.	Bromsgrove District	2017	To be identified	

BDC – Bromsgrove District Council **WWT** – Worcestershire Wildlife Trust **STW** – Severn Trent Water
BW – British Waterways **EA** – Environment Agency
BASC – British Association for Shooting and Conservation

Noble Chafer
Gnorimus nobilis
Species Action Plan

1. Introduction
In Great Britain this beetle is classified as *Vulnerable* in the Red Data Book of Insects. It is a priority UK BAP species and part of Natural England's Species Recovery Programme.

2. Current Status
2.1 Ecology and habitat requirements
In Worcestershire the known noble chafer breeding sites are all in old orchards, although the adult beetles may be seen flying elsewhere. In other counties it has been found in open woodlands and pasture woodland as well as orchards. The larvae develop in decaying wood and wood mould in old standing trees, especially fruit trees such as *Prunus* sp. plum and cherry, *Prunus domestica* var. *institia* damson, *Malus* sp. apple, *Pyrus* sp. pear and also *Quercus* sp. oak for which there is one national record. The normal larval development period seems to be around two years in fruit trees. Flying adult beetles have been found during the daytime visiting flower heads, especially *Heracleum sphondylium* hogweed, *Filipendula ulmaria* meadowsweet and *Sambucus nigra* elder, usually during very warm weather especially in late June and July.

2.2 Population and distribution
The noble chafer has been rare in Britain for over a century but appears to have undergone a considerable decline in range. Distribution of the species before 1970 is evidenced in records from North Devon, South Hampshire, West Sussex, East Kent, West Kent, Surrey, South Essex, Middlesex, Oxfordshire, Buckinghamshire, East Norfolk, West Gloucestershire, Herefordshire, Worcestershire and Cumbria reducing to South Hampshire, West Gloucestershire and Worcestershire after 1970. The main national distribution today is in Gloucestershire, Worcestershire and east Herefordshire. It is probably more widespread in Worcestershire than in the other two counties. Survey work to date has found evidence of the beetle in orchards both near and in the Wyre Forest, the Teme valley and near Pershore and Evesham (figure 1). Nationally there are very few modern records elsewhere.

2.3 Legislation
The noble chafer is listed under Section 74 of the Countryside and Rights of Way Act 2000.

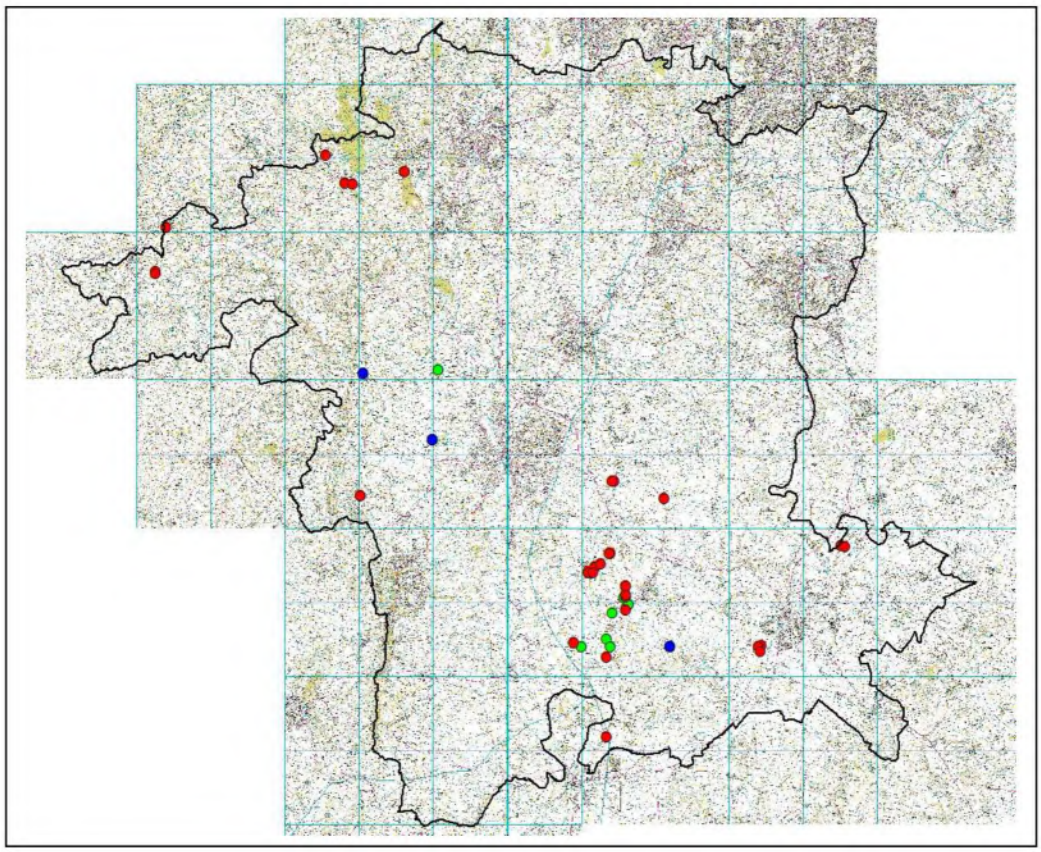

Figure 1. Records for noble chafer in Worcestershire to 2007. Records pre-1979 are shown blue, 1980-1999 shown green and 2000-2001 shown red. Data provided by Worcestershire Biological Records Centre. *Note some data is displayed at hectad level.*

2.4 Summary of important sites

The following sites are considered to be the most important locations within Worcestershire for noble chafer:

- Tiddesley Wood Plum orchard near Pershore falls within an 80 ha woodland nature reserve site owned and managed by Worcestershire Wildlife Trust. Evidence of noble chafer has been found in a large number of the old fruit trees.
- The Vale Landscape Heritage Trust (VLHT) and the Cleeve Prior Heritage Trust between them manage seven orchards in the Evesham area ranging in size from 0.6 to 6 acres and consisting of a variety of fruit species including plum, pear, damson, apple and cherry. One of the orchards at Cleeve Prior has evidence of noble chafer beetle. The VLHT have recently successfully concluded negotiations to purchase a further 70 acres of plum and damson orchard at Hipton Hill, Lenchwick.
- Several plum and apple orchards in SE and Central Worcestershire.
- Orchards south of Wyre Forest and near Menith Wood.
- Orchards scattered along the Teme valley and nearby.

3. Current factors affecting the species

- Loss of habitat through the grubbing out of old orchards and removal of fruit trees that have started to decay, leading to gaps in the age structure so that a succession of old trees with decaying centres is no longer available.

- The economic decline of the industries associated with orchards meaning there is little commercial incentive to maintain trees or replace dead ones.
- The felling of ancient trees, removal of dead wood from living trees and the destruction or removal of standing and fallen dead wood for reasons such as aesthetic tidiness, public safety or for use as fire wood.
- Loss of nectar and pollen sources through inappropriate management of orchard grassland and nearby rough grassland.
- Use of chemical pesticides in orchards to control insect pests.
- Lack of awareness of the cultural value of traditional orchards and their importance as a vital wildlife habitat.
- Many surviving orchards are found close to or in villages and farmsteads and the pressure to provide extra housing coupled with the lack of legal protection means that many of these orchards are threatened by development. When old farm buildings are converted to housing nearby orchards may be removed or tidied-up.

4. Current Action

4.1 Local protection

Most orchards in which noble chafer has so far been found are privately owned and unprotected. Exceptions are both Tiddesley Wood plum orchard and the old apple orchard at the Knapp and Papermill Reserve, both owned by Worcestershire Wildlife Trust, and small plum orchards near Evesham and Cleeve Prior owned by the Vale Landscape Heritage Trust and Cleeve Prior Heritage Trust. Some orchards on the southern margin of the Wyre Forest are within the Wyre Forest SSSI.

4.2 Site management and programmes of action

Worcestershire Wildlife Trust is currently undergoing a programme of restoration work at Tiddesley Wood plum orchard. This involves in-planting and maintenance within the existing old plum orchard, and the creation of a new orchard in an adjacent field with the planting of 100 new trees of traditional, local plum varieties.

Four of the orchards currently managed by the **Vale Landscape Heritage Trust** and **Cleeve Prior Heritage Trust** are being restored by the in-planting of new fruit trees and shrubs. Local volunteers are maintaining two other orchards in their current form and one new orchard has been recently planted. Following the successful purchase of the Hipton Hill orchard a management plan will be developed and implemented here.

The **People's Trust for Endangered Species** (PTES), the lead partner for the UK Noble Chafer BAP, acquired Rough Hill Orchard in 2003. The orchard contains about 180 trees, mainly of Worcester Pearmain and Newton varieties of plum, all probably about eighty years old and which had been much neglected. As a result of the dead wood that had accumulated, Rough Hill had become one of the most important sites for invertebrates in the county. Entomological surveys discovered the rare *Ampedus rufipennis* cardinal click beetle in the orchard, listed as vulnerable in the UK Red Data Book and a priority UK BAP species, in addition to 13 other species of Nationally Scarce insect species. Noble chafer has not been found yet but restoration work and surveys are continuing and the site has potential for colonisation by noble chafer because of its proximity to Tiddesley Wood. Future management of the orchard will strike a balance

between retaining some of the scrub and deadwood for birds and insects and ensuring the restoration of the unimproved pasture to encourage the growth of wild flowers. Around 50 new fruit trees have been grafted from current trees and planted to replace those that have died and to ensure a varying age structure within the orchard. A practical conservation group will be set up to meet once a month and carry out practical management work such as scrub clearance, path maintenance, tree planting, and conducting surveys.

Traditional orchard management and restoration advice and guidance is available from **Natural England**.

In 2007 the **Wyre Forest Landscape Partnership** were successful in their application for an HLF development grant of £1.86 million for the 'Grow with Wyre' project. The project is focused on the landscape of the Wyre Forest and its surrounding area, and comprises 22 wide-ranging sub-projects. One of these involves the establishment of a Wyre Community Land Trust to bring together small orchard owners within the forest and undertake work to restore and rejuvenate those orchards and market their produce. The project will provide opportunities for surveying participating orchards for noble chafer.

Worcestershire Countryside Service runs a programme of promotion to encourage the planting of traditional variety fruit trees that are locally sourced.

Grants are available to landowners through the **Environmental Stewardship** Higher Level scheme for the maintenance, restoration and creation of traditional orchards.

4.3 Survey, research and monitoring

- During recent years survey work to search for orchards used by noble chafer has been organised by PTES. Several parts of the county have been examined though the effort of both consultant ecologists and volunteer amateur naturalists and more work is planned. In 2006 PTES received funding from English Nature's Countdown 2010 Biodiversity Action Fund and initiated a 2-year project in the counties of Herefordshire, Gloucestershire, Worcestershire, Cambridgeshire, Cumbria, Devon, Essex and Kent to research traditional orchards, where they are and what condition they are in.

- A UK Orchard Biodiversity Action Plan is currently in development.

5. Associated Plans

Traditional Orchards, Acid Grassland, Neutral Grassland, Calcareous Grassland.

6. Vision Statement

To gain a full understanding of the extent and condition of the traditional orchard resource in Worcestershire where all known noble chafer sites are under management appropriate to maintaining both the integrity and longevity of the habitat and the noble chafer populations within them.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Population	Maintain noble chafer populations at all known sites (2007 data)	25 sites	25 sites	2017
Range	Survey 100% of traditional orchards prioritised for possibility of containing noble chafer. Selected orchards within 24 parishes in four key areas of the county will be surveyed (where for BARS purposes a parish is considered a 'site').	0 sites	24 sites	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisation
WRC NBC CA 01	**2.11**	Respond to noble chafer records received from the public with a visit to confirm presence and provide orchard management advice.	Worcestershire	2017	WR	WBRC WWT PTES
WRC NBC CA 02	**2.11**	Distribute noble chafer / orchard management leaflet to traditional orchard owners, Local Authority decision makers and nature conservation staff.	Worcestershire	2010	WWT	WR
WRC NBC CP 01	**3.15**	Hold ten guided walks held for the public on traditional orchard management and noble chafer conservation.	Tiddesley Wood	2017	WWT	WR
WRC NBC CP 02	**3.15**	Annual display at public event on noble chafer conservation and recording	Tiddesley Wood	2017	WR	WWT
WRC NBC CP 03	**3.15**	Ten articles on noble chafer conservation, current status and distribution written for local publications or media.	Worcestershire	2017	WR	WWT
WRC NBC FR 01	**4.10**	Write funding opportunities strategy for Worcestershire Traditional Orchard / Noble Chafer project.	Worcestershire	2008	WCC	
WRC NBC ID 01	**8.5**	Develop priority list of orchards to be surveyed for noble chafer within target	Worcestershire	2010	WR	PTES

		parishes.				
WRC NBC SU 01	**13.2**	Ground truthing to confirm condition status of important traditional orchards identified through PTES orchard project and Worcestershire Habitat Inventory.	Worcestershire	2010	WR	PTES WCC WBRC
WRC NBC SU 02	**13.2**	Complete noble chafer survey within traditional orchards on priority list.	Worcestershire	2017	WR	PTES

WWT – Worcestershire Wildlife Trust **WCC** – Worcestershire County Council **PTES** – People's Trust for Endangered Species
WR – Worcestershire Recorders **WBRC** – Worcestershire Biological Records Centre

References and further information

www.ptes.org

www.wbrc.org.uk

White-Clawed Crayfish
Austropotamobius pallipes
Species Action Plan

1. Introduction
The white-clawed crayfish is the only species of crayfish native to the British Isles, where it occurs in the greatest concentrations anywhere in the world. The UK supports approximately 24% of the world population and it is a priority UK BAP species.

The white-clawed crayfish has suffered serious population decline both in the British Isles and throughout its global range as a result of crayfish plague, the introduction of non-native crayfish species, pollution and habitat destruction.

2. Current Status
2.1 Ecology and habitat requirements
White-clawed crayfish are found in a range of freshwater habitats including canals, lakes, rivers, streams, quarries and reservoirs. They tend to be found in areas of mineral rich waters with calcareous substrate. They are largely found in watercourses which are 1.5m deep or less, although they can be found in deeper waters (Holdich, 2003).

White-clawed crayfish occupy cryptic habitats under rocks, within woody debris, within tree roots and within algae and macrophytes. They also burrow into riverbanks and can be found under overhanging banks. Crayfish emerge from these refuges to forage for food, principally at night. They are omnivorous, feeding on detritus, invertebrates, carrion, macrophytes and algae (Holdich, 2003).

Studies carried out throughout Britain show that there is little genetic variability between populations and the British sub-species (*Austropotamobius p. pallipes*) is closely related to the French populations (Holdich 2003).

2.2 Population and distribution
Its natural range is restricted to Europe, occurring east to west from Slovenia, Italy, Switzerland and Austria, to Spain, France and the British Isles. Isolated populations also occur in Germany and Portugal (Holdich, 2003).

White-clawed crayfish were once widespread throughout much of Britain and Ireland but since the 1980's many of Britain's crayfish populations have been eliminated as a result of crayfish plague, a disease carried by *Pacifastacus leniusculus* American signal crayfish, as well as through the continued destruction of their habitat, mainly as a result of land drainage works. Populations are now largely confined to isolated pockets in North and Central England, including parts of Worcestershire.

White-clawed crayfish occur in several sub-catchments in Worcestershire, including in the headwaters of Malvern streams, the River Arrow and tributaries, the Wyre Forest and the Badsey Brook. These isolated populations make up a significant proportion of the national population.

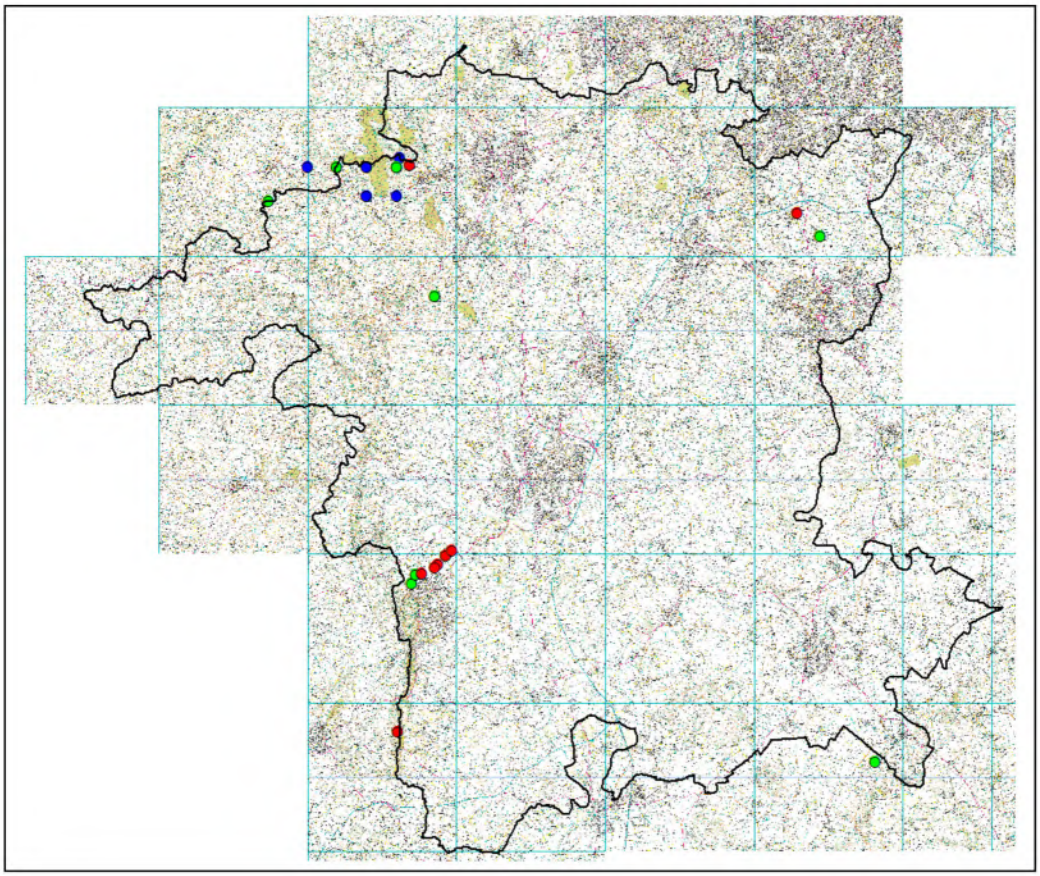

Figure 1. Records for white-clawed crayfish in Worcestershire to 2007. Records pre-1979 are shown blue, 1980-1999 shown green and 2000-2001 shown red. Data provided by Worcestershire Biological Records Centre.

2.3 Legislation and site designation

This species is listed in Appendix III of the Bern Convention and Annexes II and V of the EC Habitats Directive. It is classed as *Globally Threatened* by IUCN/WCMC. It is protected under Schedule 5 of the Wildlife and Countryside Act in respect of taking from the wild and sale. Natural England enforces this legislation by requiring a Crayfish Conservation Licence to be sought for any activity that has the potential to detrimentally impact crayfish. Under the Habitats Directive sites should be designated as Special Areas of Conservation (SACs) for their protection. There are several rivers that have been designated as SACs for the presence of crayfish, although none of these occur in Worcestershire. There are several watercourses in the county which are designated Special Wildlife Sites, in part due to the presence of native crayfish.

It is an offence to use any species of crayfish for angling bait as well as being an offence to fish for any species of crayfish without a licence under Environment Agency bylaws.

2.4 Summary of important sites

Given the fragile status of white-clawed crayfish in Britain and throughout Europe, all known native crayfish populations are considered important for the long term survival of the species. In Worcestershire populations are known to occur in a number of Teme tributaries, the Wyre Forest, Malvern Hills headwaters, the River Arrow and its tributaries and the Badsey Brook.

3. Current Factors Affecting the Species

- White clawed crayfish populations have suffered through a prolonged period of habitat degradation, as a result of dredging, straightening and bankside reinforcement.

- A reduction in water quality in the past through discharges to watercourses and as a result of diffuse pollution from agriculture have also lead to a reduction in the quality of habitat for crayfish. However in recent years water quality in our rivers and streams has improved significantly as a result of better regulation and tighter controls over discharges to watercourses.

- Degradation of rivers and streams has largely halted and in many areas habitat improvements are evident. As a result of this historic degradation the remaining populations have been largely confined to those rivers and streams that have not been intensively modified or polluted. Interestingly several previously unknown populations of white-clawed crayfish have been discovered in recent years in Worcestershire. Some of these watercourses have been routinely monitored for many years without any previous signs of crayfish. Whether the re-emergence is an indication of the recovery of very low density populations as a result of habitat and water quality improvements is unknown.

- Arguably the most significant threat to white-clawed crayfish is that of the introduced non-native crayfish species, particularly the American signal crayfish, and the disease *Aphanomyces astaci* crayfish plague. Signal crayfish (and other introduced species) are more aggressive, faster growing and predate native crayfish. As a result they will ultimately displace white-clawed crayfish, irrespective of the presence of crayfish plague. Signal crayfish carry crayfish plague without any harm to themselves, but when they come into contact with white-clawed crayfish the disease will rapidly wide out the native species.

- There are also various natural predators of crayfish including several fish species, *lutra lutra* otter, *Mustela vison* mink and even *Arvicola terrestris* water vole. In healthy river systems where crayfish exist at normal levels predation will not have a significant impact upon populations. However where populations are already in decline predation may be enough to have a significant impact.

- Water quantity is also a crucial criteria affecting the viability of the crayfish, with over abstraction or prolonged drought having the potential to decimate populations.

4. Current Action

4.1 Local Protection

The majority of rivers and streams known to contain white-clawed crayfish are designated Special Wildlife Sites, in part due to the presence of crayfish.

4.2 Site management and programmes of action

- The Environment Agency takes the requirements of white-clawed crayfish into account in its capital and maintenance works and when carrying out its regulatory function of issuing consents. For example any works on watercourses that may affect white-clawed crayfish will only be consented if it can be demonstrated that the work will result in an improvement to crayfish habitat.

- Many types of work to watercourses affecting white-clawed crayfish require a Crayfish Conservation Licence from Natural England. Licences will only be granted for work resulting in habitat enhancement.

- Through the Asset Management Process (AMP) the Environment Agency has been working with Water Treatment Providers to ensure that the quality of discharge to watercourses is sufficient to safeguard the associated flora and fauna. Where white-clawed crayfish are known to be present their requirements are taken account of in determining the appropriate discharge rate.

- The Environment Agency will not permit trapping for Signal crayfish where there is a potential that white-clawed crayfish will be affected.

- The Worcestershire Wildlife Trust and the Environment Agency work with local planning authorities to ensure that planning applications which have the potential to impact upon crayfish are modified such that they do not harm crayfish populations.

4.3 Survey, research and monitoring

- The Environment Agency and Worcestershire Wildlife Trust surveyed all historically known white-clawed crayfish watercourses to determine current population extent in 2000-2002. Additional surveys have been carried out since, but there is a need for a comprehensive update in the county.

- The Life in UK Rivers venture, involving English Nature, Countryside Council for Wales, Environment Agency, Scottish Environment Protection Agency, Scottish Natural Heritage and the Scotland and Northern Ireland Forum for Environmental Research, published *Ecology of the White Clawed Crayfish* (Holdich, D) as part of the Conserving Natura 2000 Rivers Ecology series.

- Guidance on Works Affecting White Clawed Crayfish (Peay, 2000) and Guidance on Habitat for White Clawed Crayfish (2002) were prepared for the Environment Agency and English Nature.

5. Associated plans

Rivers and Streams, Ponds and Lakes, Canals.

6. Vision Statement

All known white-clawed crayfish populations being safe and secure and populations expanding to colonise all suitable rivers and streams.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Range	Ensure appropriate management of watercourse and riparian habitat for all known white-clawed crayfish sites and upstream and downstream of known population extent	0 sites	10 sites	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Supporting Organisations
WRC WCC CP 01	**3.6**	Produce five media releases to publicise the threats from and impacts of non-native crayfish and the current status of the native crayfish.	Worcestershire	2017	EA	WWT, NE
WRC WCC FR 01	**4.11**	Co-ordinate and secure funding for a project to survey upstream and downstream of known sites for a distance of at least 1km in each direction, or until crayfish cease to be found, to identify new/extended populations and identify any opportunities for habitat creation and restoration adjacent to existing populations. Collate existing advice and guidelines for white-clawed crayfish habitat management.	Worcestershire	2012	EA	WWT, NE
WRC WCC ID 01	**8.5**	Establish county inventory of white-clawed crayfish sites and populations to be held at Worcestershire Biological Records Centre.	Worcestershire	2010	EA	WBRC
WRC WCC PL 01	**9.4**	Ensure flood management projects and consents granted do not adversely impact on white-clawed crayfish sites or populations.	Worcestershire	2017	EA	WWT, NE
WRC WCC PL 02	**9.17**	Ensure the Severn River Basin Management Plan contains measures that protect and enhance white-clawed crayfish sites and populations.	Worcestershire	2009	EA	WWT, NE

WRC WCC SM 01	**12.11**	Ensure all necessary bio-security measures are in place and undertaken when surveying, managing sites, training etc to avoid spread of non-native species and crayfish plague.	Worcestershire	2009	EA	WWT, NE
WRC WCC SM 03	**12.13**	Prepare action plan for use when species discovered in additional sites.	Worcestershire	2010	EA	WWT, NE

WWT – Worcestershire Wildlife Trust **NE** – Natural England **WBRC** – Worcestershire Biological Records Centre
EA – Environment Agency

References and further information

Peay, S (2000). Guidance on Works Affecting White-Clawed Crayfish. Report to English Nature and the Environment Agency.

Peay, S. (2002). *Guidance on Habitat for White-clawed crayfish and its restoration.* Environment Agency Technical Report W1-067/T.

Common Club-tail
(Club-tailed Dragonfly)
Gomphus vulgatissimus
Species Action Plan

1. Introduction

Gomphus vulgatissimus is regarded as nationally scarce in Britain (occurring in 16-100 10km national grid squares). This may change when the British Dragonfly Society has completed it's review of species. In Worcestershire the dragonfly has been recorded in 15 ten-kilometre squares representing 19% of the national reserve and making it possibly the most important county in the UK for the species. It is the only representative of its family in the UK.

2. Current Status

2.1 Ecology and habitat requirements

The dragonfly is distinguished by being the only dragonfly in the UK whose eyes are set apart. It is black with yellow markings and is on the wing between early May and early July. Found on moderate to slow flowing, meandering rivers with silty beds, the larvae spend up to three years in the river. The quality of the river is paramount during this development. For the adult there appears to be a need for refuge areas of scrub or woodland either at the riverside, or wherever the nearest cover is available, where maturation and later pairing takes place.

Whilst the exact optimum requirements of the species are not fully understood, the habitat where it is most abundant coincides with rivers having: good quality; reliable flows in summer; banks where there is little disturbance especially between early May to early June; channels not subject to dredging or other kinds of disturbance; not suffering from over stocking of fish or water fowl; situated in wooded valleys where there is ample refuge areas.

2.2 Population and distribution

Although found on still waters in other parts of Europe, this widespread but never common dragonfly is entirely confined to southern rivers like the Thames, Severn, Arun, Dee, Wye Teifi and Twyi in the British Isles. In Worcestershire it is found on the Severn right through the county and also on the tributary rivers Teme and Avon. Within Worcestershire it has been recorded in 158 one-kilometre squares (figure 1) of which 118 squares have proven breeding. The species has shown a slight increase in range in the county since 1998, however a long-term survey at Bewdley has identified a drastic fall in emergence rates in the years 2002 –2006. It is not yet clear whether this is a temporary decline or not.

2.3 Legislation

The species has no specific legal protection.

2.4 Summary of important sites

The species is found all along the River Severn in Worcestershire, although mainly upstream of Worcester City, on the River Teme up to Tenbury and up the River Avon into Warwickshire.

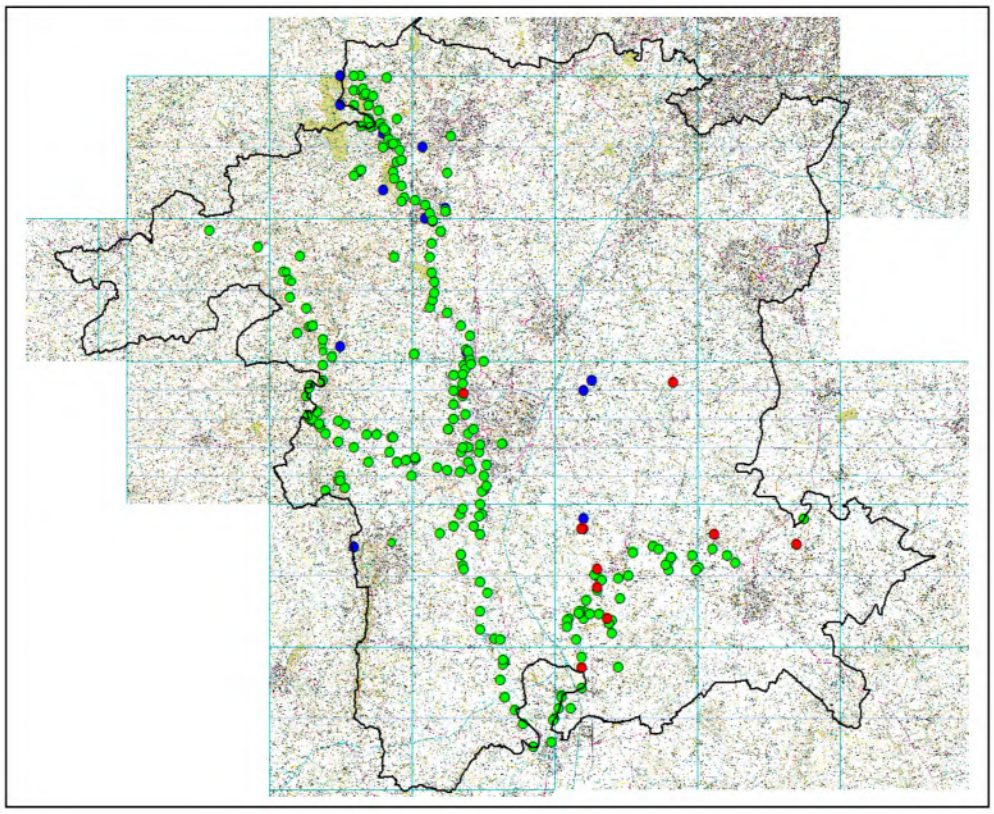

Figure 1. Club-tailed dragonfly records for Worcestershire to 2003. Records pre-1979 are shown blue, 1980-1999 shown green and 2000-2003 shown red. Data provided by Worcestershire Biological Records Centre. *Note some data is displayed at tetrad level.*

3. Current factors affecting the species

Factors affecting the life cycle of the dragonfly include:

- Poor water quality.
- Unsympathetic river and bankside management.
- Prolonged seasonal low levels giving rise to reduced water quality.
- Loss of nearby woodland where pairing takes place.
- Bank side damage by grazing or trampling during the crucial synchronised emergence period from early May to mid June.

Gomphidae are one of the pollution-sensitive taxa assigned a value in the biomonitoring indices used to assess water quality. Under the Biological Monitoring Working Party (BMWP) system *G. vulgatissimus* is assigned a value of 8 (10 being the most sensitive) illustrating its vulnerability to pollution

4. Current Action

4.1 Local protection

The River Teme is a SSSI and county Special Wildlife Site. The Rivers Severn and Avon are also county Special Wildlife Sites. Gwen Finch, a wetland site on the River Avon, is owned and managed by Worcestershire Wildlife Trust as a nature reserve.

4.2 Site management and programmes of action

The Environment Agency is aware of the emergence period when planning their riverside programmes and the species is noted in the Environment Agency management documents.

Worcestershire Wildlife Trust's **Gwen Finch** nature reserve is situated on the floodplain of the Rive Avon near Eckington. Prior to its restoration the site was a 20-hectare agriculturally drained semi-improved ryegrass lay with little or no wildlife value. Restoration works began in 1999 when WWT purchased the site and were completed in 2001. This involved the creation of 4 large scrapes, 3 of which were planted with reeds. A former drainage ditch together with sections of the river were re-profiled to create shallow areas. Water from the Berwick Brook is pumped onto the site via two windpumps with any excess returning to the river. By 2001 *Lutra lutra* otter were already using the reserve and *Tringa totanus* redshank, *Motacilla flava* yellow wagtail and *Acrocephalus scirpaceus* reed warbler were breeding. The site is one example where the riparian habitat within the Avon floodplain is being managed purely for wildlife benefit and club-tailed dragonfly has been recorded here.

4.3 Survey, research and monitoring

The Dragonflies of Worcestershire (Averill, 1996) was published following 10 years of survey work to build up a complete picture of all dragonfly species' distribution and ecology in the county. The book is now out of print but limited copies are available from Worcestershire Wildlife Trust.

The British Dragonfly Society began a long-term study on club-tailed dragonfly on the River Severn at Bewdley in 1987. Since then surveys have been undertaken on an annual basis (with the exception of 2001 due to FMD), with occasional parallel surveys on the Avon and the Teme. The dragonfly cannot be surveyed by counting adult numbers because they stray so far from their riverside origins. Instead surveys of adult emergences are the best way to locate the breeding site and also give an absolute count of abundance and it is the larval cases (exuviae) that are counted. In this way emergence numbers can be compared from one site or river to another and from one year to another.

5. Associated Plans

Rivers and Streams, Wet Woodland, Scrub.

Although not covered by separate plans, the habitat favoured by the club-tailed dragonfly is coincident with another restricted species, *Platycnemis pennipes* white-legged damselfly. In addition, the arrival of *Libellula fulva* scarce chaser (scarcer nationally that the club-tailed dragonfly) on the River Avon since 2004 has shown the river to be more important than once thought.

6. Vision Statement

To ensure that the range and abundance of the species in Worcestershire is shown to be 'holding its own' or increasing.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Range	Maintain known distribution of species throughout the county	118 1km squares	118 1km squares	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC CTD AP 01	**1.6**	Ensure species' ecology and habitat requirements are taken into account in all riverside management work plans and programmes.	Rivers Severn, Avon and Teme and adjacent woodland and scrub	2017	EA	NE
WRC CTD AP 01	**1.6**	Ensure species' ecology and habitat requirements are taken into account in all riverside management work plans and programmes.	Rivers Severn, and Avon and adjacent woodland and scrub	2017	BW	NE
WRC CTD CA 01	**2.11**	Produce best practice guides for owners of riparian habitat, and owners of adjacent woodland and scrub habitat.	Rivers Severn, Avon and Teme	2010	BDS	
WRC CTD CA 02	**2.13**	Using best practice guidance produced, promote sympathetic management of riverside and adjacent habitat by landowners.	Rivers Severn, Avon and Teme	2017	EA	
WRC CTD CA 02	**2.13**	Using best practice guidance produced, promote sympathetic management of riverside and adjacent habitat by landowners.	Rivers Severn, Avon and Teme	2017	FWAG	
WRC CTD CA 03	**2.13**	Using best practice guidance produced, promote sympathetic management of riverside and adjacent habitat by landowners.	Forest of Feckenham, Severn and Avon Vales	2017	WWT	
WRC CTD CP 01	**3.15**	Seek 6 opportunities to promote awareness of	Worcestershire	2017	BDS	EA

		the species to the public and within the conservation sector through the media or written publications.				
WRC CTD SM 01	**12.1**	Maintain communication with landowners in locations where the species is found and seek to secure appropriate management of habitat.	Rivers Severn, Avon and Teme and adjacent woodland and scrub	2017	BDS	
WRC CTD SU 01	**13.4**	Monitor distribution and abundance of species: annually on the river Severn at Bewdley and at least every 3 years on study sites on the rivers Avon and Teme.	River Severn at Bewdley	2017	BDS	

BDS – British Dragonfly Society
EA – Environment Agency
FWAG – Farming and Wildlife Advisory Group
WWT – Worcestershire Wildlife Trust
BW – British Waterways

References and further information

Averill, M (1996). *The Dragonflies of Worcestershire.* Published by the author.

www.dragonflysoc.org.uk

Stag Beetle
Lucanus cervus
Species Action Plan

1. Introduction
The stag beetle is a priority UK BAP species for which the People's Trust for Endangered Species (PTES) is the lead partner.

2. Current Status
2.1 Ecology and habitat requirements
Stag beetles are Britain's largest terrestrial beetle: males can be up to 70mm (2.5 inches) long; females are smaller, without the characteristic male 'antlers', designed to ward off other male stag beetle. Both sexes have a shiny black head and thorax and their wing cases are chestnut brown. The larvae spend between three and a half and five years as white grubs underground in the decaying roots and stumps of deciduous trees before emerging as fully-grown adult insects. The majority of adults live for only a few weeks in the summer in order to mate, although a few may survive the winter till the following year. Males are most likely to be seen in flight on warm summer evenings between May and August while they look for a mate.

Habitats used by the stag beetle include urban areas such as parks, allotments and gardens and old landscapes with networks of hedgerows, as well as broadleaved woodland and pasture woodland. Stag beetles seem to use many types of wood; they have been reported on *Quercus* sp. oak, *Fraxinus excelsior* ash and *Fagus sylvatica* beech and also fruit trees including *Pyrus* sp. pear, *Malus* sp. apple and *Prunus* sp. cherry. They prefer the warmer areas of Britain, and light soils into which they can dig and move about more easily, and they sometimes follow river courses where old oaks often survive.

2.2 Population and distribution
The stag beetle is still widespread in southern England, especially the Thames valley, north Essex, south Hampshire and West Sussex. It also occurs fairly frequently in the Severn valley and coastal areas of the south-west.

Worcestershire is close to the northern edge of the stag beetle's present British range. The beetle survives in apparently isolated populations around Upton-upon-Severn and in Worcester city (figure 1) where suitable quantities of decaying wood, especially tree stumps, can be found. Further records from Bredon Hill, Redditch, Pinvin and Cleeve Prior require confirmation.

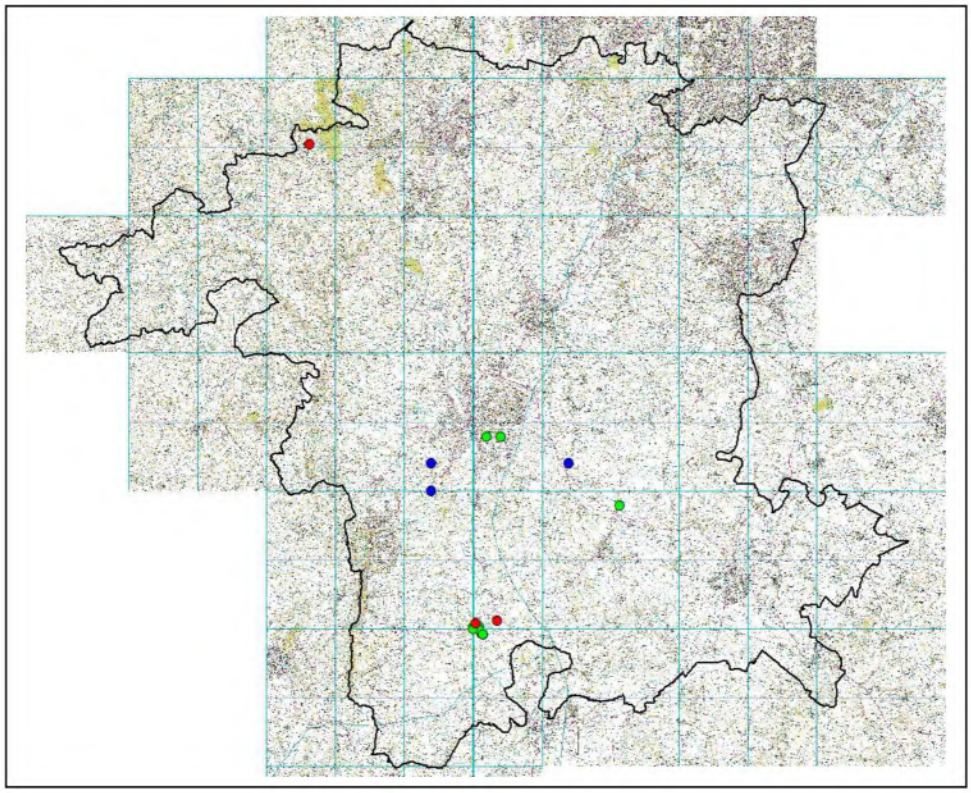

Figure 1. Records for stag beetle in Worcestershire to 2007. Historic records (pre-1900) are shown blue, 1986-1999 shown green and 2000-2007 shown red. Data provided by Worcestershire Biological Records Centre. *Note some data is displayed at hectad and tetrad level.*

2.3 Legislation

The stag beetle is protected under Schedule 5 of the Wildlife and Countryside Act 1981. It is listed on Annex II of the EC Habitats Directive and under the Section 74 list arising from the CROW Act 2000.

2.4 Summary of important sites

Upton-upon-Severn area

The stag beetle is known from relatively few areas in Worcestershire with the bulk of the rather small population centred on Upton-upon-Severn. It appears that the beetles there are using a limited number of town centre trees (and long-dead tree stumps) for breeding, with at least 5 larval sites known from survey information gathered in 2000 and 2001. Some of the larval sites are in remnant hedges scattered through the town though there are notable isolated 'veteran' trees / stumps that appear to be very important for the local beetle population. Nearby villages also hold beetles though the exact larval sites have not yet been discovered.

Worcester

There are also confirmed stag beetle records for Worcester Woods Country Park and unconfirmed sightings from school grounds elsewhere in the City. Little is known about their exact situation or the micro-habitats utilised by the beetles in these areas although it is assumed that veteran trees and old hedgerow networks are important.

3. Current factors affecting the species

- **Removal of deadwood.**
  This is the main threat as dead wood (in a variety of forms) provides the larval habitat, without which the population cannot survive. The beetles are especially associated with tree stumps or the bases and root systems of old, partially decayed trees and hedges. A more significant long-term threat is therefore likely to be the lack of suitable trees / hedges to take the place of the existing stock of large rotting timber.

- **Treatment of deadwood.**
  Chemically treated stumps may interfere with normal decay patterns. Larvae can also be found associated with untreated decaying fence posts and structural timber.

- **Accidental or deliberate killing of beetles.**
  Stag beetles may be killed accidentally or deliberately on roads or underfoot and although this is not yet proven to impact significantly on populations there is anecdotal evidence that it may be a particular problem near the larval sites in Upton-upon-Severn.

- **Climate change and range contraction.**
  Worcestershire is on the edge of the stag beetle's range and the impact this has on the local population is not fully understood. It is possible that climatic effects (especially daytime temperature) limit the areas of the county that are suitable for use by the beetle, rendering sites that would be otherwise adequate unusable.

- **Spraying hedgerows with insecticide.**
  Stag beetle larvae can exist in old hedgerows, which often contain decaying wood. If such a hedgerow is treated with insecticide it may result in damage to, or death of, the larvae and beetles.

4. Current Action

4.1 Local protection

Some stag beetle host-trees may be the subject of Tree Preservation Orders. A TPO does not prevent the removal of deadwood on trees, but could be used to make the tree owner aware of the Wildlife and Countryside Act 1981 protection.

4.2 Site management and programmes of action

The People's Trust for Endangered Species can provide information and advice on stag beetle conservation, habitat management and details of current surveys.

PTES have produced leaflets including 'Stag Beetle Friendly Gardening', which provide information for the public on managing stag beetle habitat in gardens and green spaces, encouraging the retention and creation of deadwood habitats. Advice leaflets were distributed with the Great Stag Hunt questionnaire (see below).

4.3 Survey, research and monitoring

PTES launched 'The Great Stag Hunt' in 1998 to accurately map the current distribution of the beetle. Leaflets with a species description and recording sheet were distributed around the presumed population range and beyond. Over

100,000 leaflets about the species and its conservation needs were distributed and approx. 10,000 records were sent in from the general public. In Worcestershire 'The Great Stag Beetle Hunt' was coordinated by Worcestershire Wildlife Trust on behalf of PTES. Where possible, attempts were made to confirm records and discover suitable habitat.

Worcestershire Wildlife Trust carried out two additional major leaflet surveys in 2000 and 2001 centered on the Upton-upon-Severn area. Results from these have been collated and provide a starting point for further research work in the south of the county. Additional records from elsewhere in Worcestershire may help to direct work in other Districts.

Further surveys under the 'Great Stag Hunt' banner were carried out by PTES in 2002 and 2006. Worcestershire results have been included in the project results.

In 2005, PTES launched a new project **Bury Buckets 4 Beetles** to help monitor stag beetle populations across the country. The project provides advice and information to encourage the public to create and monitor artificial stag beetle habitat.

5. Associated Plans

Veteran Trees, Ancient / Species-rich Hedgerows.

6. Vision Statement

Maintain existing populations throughout the county by sympathetic management practices and monitoring techniques.

Improve knowledge of stag beetle population distribution within Worcestershire by encouraging monitoring in suitable areas.

Encourage land managers and the public to consider stag beetles and follow available best practice guidance.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Range	Maintain larval sites identified as current priority areas	8	8	2017
Range	Identify and ensure appropriate management of further possible larval sites	0	10	2017
Population	Survey 100% current priority areas via public records	0	8	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC STB CA 01	**2.12**	Maintain public awareness of stag beetle populations to attempt to reduce human disturbance and persecution. Provide management advice leaflets (from PTES) to interested/relevant parties.	Upton-upon-Severn and area, Worcester City	2017	WWT	MHDC WorcsCC PTES
WRC STB HC 01	**7.2**	Create three new 'stag beetle refuges' on publicly owned land.	Upton-upon-Severn Worcester City	2010	WorcsCC MHDC WCC	WWT
WRC STB SM 01	**13.2**	Manage publicly owned sites in a manner suitable for stag beetles retaining decaying wood in situ.	Worcestershire	2017	All District Councils	PTES
WRC STB SU 02	**13.6**	Distribute survey leaflets to the public and others in key areas and collate results passing data to WBRC and PTES.	Upton-upon-Severn, and Worcester City	2010	WWT	MHDC WorcsCC

WWT – Worcestershire Wildlife Trust **MHDC** – Malvern Hills District Council **WorcsCC** – Worcester City Council
WCC – Worcestershire County Council **PTES** – People's Trust for Endangered Species
WBRC – Worcestershire Biological Records Centre

References and further information

www.ptes.org www.greatstaghunt.org

Violet Click Beetle
Limoniscus violaceus
Species Action Plan

1. Introduction
The violet click beetle is listed as Endangered in the UK Red Data Book. It is a priority UK BAP species.

2. Current Status
2.1 Ecology and habitat requirements
The violet click beetle is an 11mm long black beetle with a faint blue reflection that is found in ancient broad-leaved woodland and pasture-woodland. The beetle depends on the continued production of humid wood mould in the heart of decaying trees, seeming to favour trees where the decaying wood has attained a consistency like damp soot. This condition tends to be very rare in most woods, and in the UK the beetle has been found on only three sites and only within *Fagus sylvatica* beech and *Fraxinus excelsior* ash. It is probable that a site would require a large population of veteran trees to contain a sufficient number that offered the specific habitat conditions needed to support the species.

The beetle breeds in tree cavities and the larvae develop over 2 years in a mixture of wood, leaf mould and other debris including bird's nest remains, bird droppings and dead birds or rodents. The larvae are predatory and possibly feed on the remains of other dead insects as well as the decomposing remains of birds or animals. For this reason they are often found within trees where raptors, owls or corvids are nesting further up in the tree cavity. The pupal chambers have been recorded in February. Adults have been found in similar habitat to the larvae and are thought to be primarily nocturnal with a very short emergence period. Adults have been recorded in April and May, and have been noted visiting *Crataegus monogyna* hawthorn blossom. Although the beetle is not thought to be in decline in Britain, the micro-habitat on which it depends is so specific that it is vulnerable in the long-term, in particular due to the imbalance of age distribution in the trees on sites at which it is currently known. The beetle is very sensitive to temperature and humidity changes within the tree to the extent that once the stability of the internal environment is compromised it can seriously impact on the existence of the colony (Skidmore, 2003).

2.2 Population and distribution
Violet click beetle is very rare throughout its European range, which although extending from the UK to Slovakia and Poland, is confined to some 15 known sites in total. It is recorded in the UK in only three locations: Windsor Forest in Berkshire, Bredon Hill in Worcestershire and Dixton Wood in north Gloucestershire.

The beetle seems to be widespread on the escarpment and the upper north and west slopes of Bredon Hill with records from Bredon's Norton, Even Hill and Elmley Castle Deer Park (figure 1 below).

2.3 Legislation
The violet click beetle is protected under Annex ll of the EC Habitats and Species Directive and schedule 5 of the Wildlife and Countryside Act 1981.

2.4 Summary of important sites

Bredon Hill

Violet click beetle was first recorded at Bredon Hill in 1989, although there is a 1939 record from 'Tewkesbury' that may refer to either Bredon Hill or Dixton Wood. Bredon Hill has been designated a Special Area of Conservation (SAC) due to the presence of the beetle. The hill is recognised as one of the top five sites in Britain for saproxylic invertebrates in general, including many Red Data Book and Nationally Scarce species. The greater Bredon landscape appears to be favourable for wood mould production but whether this is through the phenotype of ash trees found there, the local microclimate, or both is unknown.

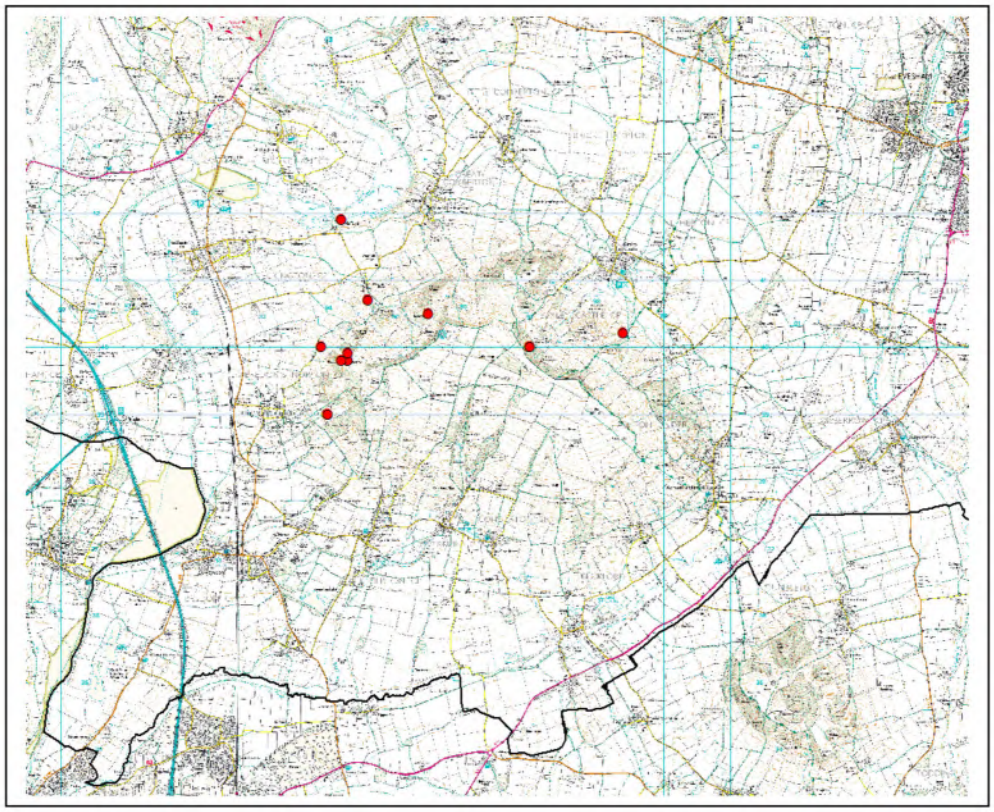

Figure 1. Records for violet click beetle in Worcestershire to 2007. Data provided by Worcestershire Biological Records Centre. *Note some data is displayed at tetrad level.*

3. Current factors affecting the species

The opening of a previously enclosed internal tree cavity to external climatic conditions, whether deliberately or accidentally, may seriously compromise the viability of a colony within that individual tree. This could be due to:

- Damage to trees during storm events.
- The removal of limbs for safety reasons.
- Pollarding of trees where the beetle's presence or absence has not first been established.
- Destructive surveying by well-meaning ecologists

Others factors affecting the species include:

- Lack of a replacement generation of trees.
- Long-term changes in the environment, such as pollution, may affect fungi that contribute to decay in trees.
- The complete removal of old trees for safety reasons.
- Removal of decaying and dead wood to tidy up sites.

- The limited ability of the species, in common with much of the old wood insect fauna, to move across open country to disperse to new sites.
- Availability of nectar / pollen sources, especially hawthorn, in spring.

4. Current Action

4.1 Local protection

Almost 360 ha of Bredon Hill were designated as a Special Area of Conservation in 2005 due to the presence of the violet click beetle. In addition, 45 ha of the hill is designated a National Nature Reserve, nearly 380 ha as a SSSI and it also falls within the Cotswolds Area of Outstanding Natural Beauty.

4.2 Site management and programmes of action

The survival of the beetle is largely dependent on maintaining and improving the age structure of the trees in which it lives. The main host-tree species in Worcestershire is ash, which seeds well and can mature rapidly. Some areas of Bredon Hill, particularly the NNR, have good amounts of regenerating ash and efforts have been made to try and prematurely age some trees by pollarding at around 25 years old and so allow the decay process to commence. Natural England is also carrying out a programme of crown reduction on the mature ash trees to prolong their life and hence potential usefulness for the species.

There has been some investigation of the construction of artificial habitats in which the beetle may become established. On Bredon Hill English Nature (as was) set up five compost bins containing a mixture of sawdust, wood shavings and chicken droppings, with the occasional dead mammal, in replication of an experiment first used in Windsor Park in 1988 to see whether favourable conditions for the beetle could be created artificially. As yet the success or failure of this experiment has not been reviewed.

Historically many young trees on the hill were removed to allow for increased stock grazing. Management of the SSSI units where the main habitat interest is woodland is focused on programmes of replanting to compensate for past removal and to supplement areas where a lack of native regeneration is occurring. There is also a problem in some areas with the ash trees being out-competed by *Acer pseudoplatanus* sycamore and management in these units includes a programme of thinning to remove the sycamore. These things will, in time, contribute to providing potential habitat for violet click beetle.

There are several agri-environment scheme agreements in place on Bredon Hill. One scheme involves the restoration of 68ha of parkland under Higher Level Stewardship with emphasis on veteran trees and scrub within the SSSI. Another agreement begun under the Countryside Stewardship and Wildlife Enhancement Schemes involves a tree planting programme within the SSSI. A third landowner is currently managing scrub on an area of 6ha adjacent to the NNR. This work involves management of hawthorn so may be of value to the violet click beetle. Other landowners have their own woodland and tree management programmes that are not currently part of scheme agreements: Natural England is hoping to incorporate these landowners into an HLS scheme in the future.

4.3 Survey, research and monitoring

Saproxylic invertebrate ecology is a huge area of research in Europe, and the UK is of significant interest because of the amount of semi-natural ancient woodland

remaining in the country and, in particular, the numbers of veteran trees in our countryside. There are more than 1700 invertebrate species dependent on dead and decaying wood for part or all of their lifecycle and this amounts to about 6% of the total British invertebrate fauna. The UK is fortunate to have a number of ecologists of international standing contributing to saproxylic invertebrate research and adding to our knowledge of, amongst others, the violet click beetle. The following are just some examples of the information available. Natural England should be the first point of contact in searching for further sources of information.

- The violet click beetle is part of Natural England's Species Recovery Programme. See: http://www.english-nature.org.uk/science/srp/default.asp.

- Skidmore undertook a survey in Windsor Park in 2002-2003 on behalf of English Nature as part of a several year investigation into the range and status of the violet click beetle in Britain. The methodology and results were published in English Nature Research Report 514.

- Several papers presented at the second pan-European conference on Saproxylic Beetles in London in 2002 focused on current research and status of violet click beetle. The conference was hosted jointly by English Nature and the People's Trust for Endangered Species (PTES). A copy of the proceedings, including full text of all the papers, can be purchased from PTES. See: www.ptes.org/about/publications.html.

Information is available on the ecology and management of veteran trees from Natural England, Worcestershire Wildlife Trust, Worcestershire Recorders and the Ancient Tree Forum.

5. Associated Plans

Veteran trees, Woodland.

6. Vision Statement

To understand the specific habitat requirements of the species in order that the necessary conditions for the species' survival can be maintained on existing sites and replicated on potential sites.

To develop a non-invasive survey methodology to allow monitoring of known populations and further survey of potential sites.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Range	Survey all parishes on Bredon Hill with current violet click beetle records for the purpose of surveying and mapping all veteran ash trees	0 parishes	3 parishes	By 2010
Population	Survey all artificial-habitat sites created for evidence of violet click beetle.	0 sites	5 sites	By 2010

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC VCB CA 01	**2.15**	Train 6 volunteers in veteran tree recording and surveying techniques to carry out recording on Bredon Hill	Bredon Hill	2009	WR	
WRC VCB CA 02	**2.11**	Provide information on veteran tree management and violet click beetle ecology and habitat requirements to Wychavon District Council tree / landscape officers.	Wychavon District	2009	WR	WWT
WRC VCB CA 03	**2.11**	Provide tree wardens within Bredon Hill parishes with information about veteran tree management and the violet click beetle.	Bredon Hill	2008	WCC	WR
WRC VCB CP 01	**3.4**	Organise two community events to highlight the biodiversity importance of veteran trees and the violet click beetle.	Bredon Hill	2008	WR	NE
WRC VCB ID 01	**8.1**	Record and map all veteran ash trees on Bredon Hill.	Bredon Hill	2010	WR	WBRC WWT

WR – Worcestershire Recorders **WBRC** – Worcestershire Biological Records Centre **NE** – Natural England
WCC – Worcestershire County Council **WWT** – Worcestershire Wildlife Trust

References and further information

Skidmore, P (2003). *Saproxylic Insect Survey of the Virginia Water and Bishopsgate areas of Windsor Park.* English Nature Research Report 514.

Smith, M (2002). *Saproxylic beetles in Britain, an overview of the status and distribution of four Biodiversity Action Plan species.* PTES, London.

Whitehead, P (2002). *Current knowledge of the violet click beetle Limoniscus violaceus in Britain.* PTES, London.

Hornet Robberfly
Asilus crabroniformis
Species Action Plan

1. Introduction

This species is classed as Nationally Notable in the UK Red Data Book, having less than 100 1km squares with records. It is on the Species of Conservation Concern List and is a Priority Species in the UK BAP. It is regarded as declining and is now not found in many counties where it once was.

2. Current Status

2.1 Ecology and habitat requirements

The hornet robberfly is one of the country's largest and most spectacular true flies: up to 28mm in length with much of the abdomen bright yellow. It has been recorded on unimproved or semi-improved pasture, heathland and chalk downland. Although the ecology of the species is still not fully understood, we know that it is intimately associated with grazing livestock, specifically the dung produced by herbivorous mammals. Evidence from robberfly sites in Worcestershire suggest that when fields cease to be grazed then the insect disappears. The way that fields are grazed can also affect the success of the insect, for instance it is often the practice to collect or scatter horse dung whereas the robberfly is most often seen on drying undisturbed mounds.

The adult fly will hunt at a small distance from breeding sites and take a wide range of insect prey – grasshoppers, beetles, moths, butterflies, bees, wasps and flies – these being found amongst a wide range of floral habitats, and even others of their own species on occasion (Pinchen *et al,* 1997). They also frequently take dung beetles of the genus *Aphodius* and flesh flies *Sarcophaga* spp. Dry dung piles are frequently used as vantage points when hunting and for sunning (Clements and Skidmore, 1998, Pinchen et al, 1998).

Asilus larva is associated with dry dung, typically that of cow or mounds of rabbit with adult emergence peaking in late July and August. Ongoing research has failed to determine the larval diet beyond reasonable doubt, although it is thought to be predatory on the dung beetle larvae also associated with herbivorous mammal dung. The larva is thought to live for 2-3 years, but recent confirmed records in the UK do not appear to exist.

2.2 Population and distribution

In the UK the hornet robberfly is distributed throughout Wales and in the southern half of England. There are records from about 37 vice-counties, but the fly is scarce throughout this range. It has declined since 1970 from being in 111 10km squares to only 48 10km squares by the early 1990s. Areas of loss are mostly from eastern England and the previous strongholds of Devon, Dorset and Hampshire. Elsewhere there is a sharp contraction of distribution (Clements and Skidmore, 1998). In Worcestershire sightings appear to be concentrated around northern and eastern Kidderminster. Figure 1 shows the current recorded distribution of hornet robberfly in Worcestershire.

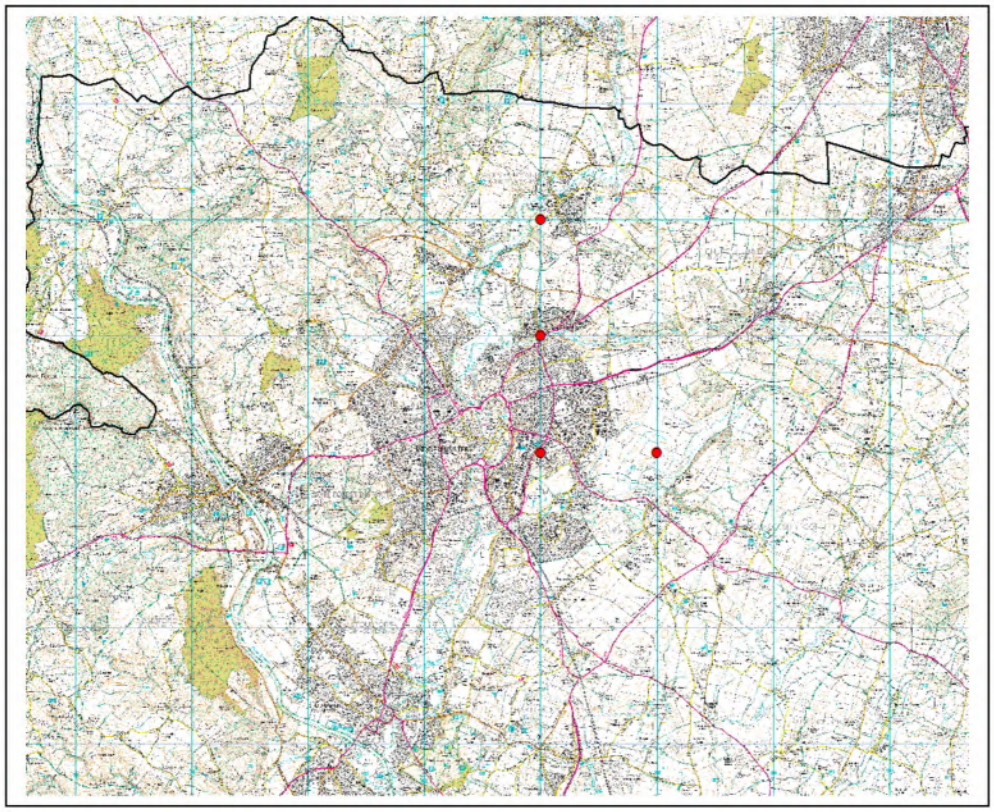

Figure 1. Records of hornet robberfly in Worcestershire to 2007. Data provided by Worcestershire Biological Records Centre. *Note records are displayed at tetrad level.*

2.3 Legislation

There is no legislation protecting hornet robberfly in the UK.

2.4 Summary of important sites

An adult fly was first found in Worcestershire during August 1995 on Hurcott Pasture, a pony grazed acid grassland SSSI on the eastern edge of Kidderminster. The pasture lies on sloping ground overlying the Bunter Sandstones of the Triassic Period, which give rise to nutrient-poor free-draining soils. The special interest lies in the size of the site and in the particular character and diversity of the semi-natural grassland sward which has been maintained by grazing, and is of a type which is nationally scarce and declining due to agricultural improvement, development and neglect.

The vegetation over most of the site conforms to the acidic grassland community characterised by *Festuca ovina* sheep's-fescue, *Agrostis capillaris* common bent and *Rumex acetosella* sheep's sorrel. Most surviving examples of this community in southern Britain are small and fragmented. There are also a number of locally uncommon or rare species that occur including *Cerastium arvense* field mouse-ear, *Cerastium semidecandrum* little mouse-ear, *Vicia lathyroides* spring vetch and *Spergularia rubra* sand spurrey.

In 1999 an additional cluster of fields around Hurcott were also found to have varying numbers of adult flies and a subsequent search found other sites between Hurcott and Cookley. Searches of pony paddocks at Hartlebury, Wilden and Churchill, surrounding localities, found no signs of the insect and so it appears to be concentrated around Hurcott. Observations there make a strong connection between horse dung and the insect with cow dung attracting fewer

flies. Every year since then has confirmed the insect using the paddocks around Hurcott.

3. Current factors affecting the species

- Loss of suitable hunting sites including areas of flora-rich pasture and a range of dung sites where adult prey items can be found.

- Treatment of livestock with anti-parasitic drugs leading to reduction or loss of dung fauna. The use of Avermectin-based products is a particular issue as a large amount of the drug passes through livestock unmetabolised and it does not readily decompose once excreted. Avermectins are popular amongst farmers for their wide-spectrum nature and ease of use.

- Land use change leading to reduction or abandonment of livestock and consequent loss of dung habitat.

- The impact of climatic changes may have an effect, as adult activity appears to be temperature-regulated and dependent on high ambient air temperatures.

- Paddock management often involves the removal or harrowing of dung.

4. Current Action

4.1 Local protection

Hurcott Pasture is a designated SSSI and several meadows adjacent to this site are managed by Wyre Forest District Council (WFDC) on behalf of the owner.

4.2 Site management and programmes of action

Cattle graze Hurcott Pasture SSSI and the two WFDC-managed fields at the rear of Hurcott Pool. Grazing is not constant but is spread throughout the year to ensure that dry dung is consistently available.

Other sites are all in private ownership and are not managed specifically for hornet robberfly.

4.3 Survey, research and monitoring

Several articles have appeared in the Worcestershire Record (the journal of the Worcestershire Recorders) about local hornet robberfly distribution and populations and these can be accessed in full on www.wbrc.org.uk.

A survey by David Green on behalf of Worcestershire Wildlife Trust was carried out in 2000 on 32 sites in the Kidderminster area in an attempt to define the characteristics of sites used by the fly. Some sites surveyed were those where the presence of hornet robberfly had previously been recorded, other sites were fields adjacent or nearby that appeared to be similar in habitat type and management regime and therefore possibly suitable. In particular, the survey looked to assess the height and condition of grass sward, the presence or absence of dung and the extent and type of grazing.

On behalf of Countryside Council for Wales, Clements and Skidmore (2002) carried out a three-year research project between 1997 and 1999 into the

autecology of hornet robberfly at two sites in South Wales. The research used mark-recapture techniques to investigate population dynamics, adult longevity and dispersal, and to try and locate and record the feeding behaviour of larvae. Other CCW commissioned research has looked at the dispersal abilities and population structure of hornet robberfly (Lloyd, 2001) and assessed the habitat suitability at a landscape scale for populations of the fly around known occupied sites (Boardman, 2006).

English Nature has published several Research Reports on hornet robberfly. One of these (Smith, 2000) contains an excellent section on livestock grazing regimes and anti-parasitic drug use and the conservation management of grazed pasture with regards to this issue. Another report summarises survey work at three sites in Dorset, Hampshire and Surrey (Pinchen *et al,* 1997) that used mark-recapture to study territory size, breeding behaviour, in particular the oviposition behaviour of females, prey items taken and other autecological factors of the species' ecology.

Hornet robberfly population numbers have been monitored for over 20 years at Figsbury Ring SSSI, a National Trust property near Salisbury, Wiltshire. Figsbury Ring is an iron-age hill fort and the steep slopes support a botanically diverse chalk grassland flora. Hornet robberfly has been regularly recorded, sometimes in significant numbers of up to 50 individuals, alongside other invertebrate species of interest such as *Lysandra bellargus* adonis blue butterfly. Cattle currently graze the site keeping the average sward height to around 4.4cm and ensuring a continuous supply of dung habitat.

5. Associated Plans

Semi-natural Grassland.

6. Vision Statement

To ascertain what the exact habitat requirements are for this species so that recommended management advice and encouragement can be tailored appropriately.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Population	Maintain presence of hornet robberfly at positive sites identified during the 2000 survey (Hurcott Pasture, Little Kingsford Farm, Sandy Lane, Hurcott adjacent fields)	4 sites	4 sites	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC HRF CA 01	**2.11**	Promote grassland management likely to favour the insect to local landowners at private stables around the core population area by providing management and grazing advice.	Kidderminster area	2010	WFDC	WWT NE
WRC HRF CP 01	**3.5**	Annual press article in local media to raise awareness of the hornet robberfly amongst the general public.	Kidderminster area	2017	WFDC	
WRC HRF FR 01	**4.13**	Approach the recording community and local people for assistance in the ongoing monitoring of known sites and recruit and train four people in ID and survey techniques.	Worcestershire	2010	WFDC	WWT WR
WRC HRF SM 01	**12.1**	Continue current management at sites under control of WFDC.	Hurcott Pasture and adjacent fields	2017	WFDC	

WWT – Worcestershire Wildlife Trust **WFDC** – Wyre Forest District Council **WR** – Worcestershire Recorders
NE – Natural England

References and further information

Boardman, P (2006). *Landscape Scale Assessment of Hornet Robberfly Populations in Monmouthshire.* CCW Contract Science Report 722.

Clements, D, K., and Skidmore, P (2002). *The autecology of the Hornet Robberfly Asilus crabroniformis L. in Wales, 1997-1999.* CCW Contract Science Report 525.

Green, D (2000). *Asilus crabroniformis: Hornet Robber Fly. Survey of the Kidderminster area, Worcestershire August-September 2000.* Worcestershire Wildlife Trust.

Lloyd, D (2001). *Dispersal abilities and population structure of the adult hornet robberfly Asilus crabroniformis at Caeau Bwlch SSSI.* CCW Contract Science Report 458.

Smith, M (2000). *The hornet robberfly Asilus crabroniformis: land use and livestock grazing regimes at sites in England.* English Nature Research Report 387.

Pinchen, B. J, Denton, J. S, and Bird, D, R (1997). *The hornet robber fly Asilus crabroniformis: Adult behaviour at selected sites in Dorset, Hampshire and Surrey in 1997.* English Nature Research Report 274.

Asilus records from Figsbury Rings SSSI are available from the National Trust Estates Department in Wiltshire.

High Brown Fritillary
Argynnis adippe
Species Action Plan

1. Introduction
The high brown fritillary is a Priority UK BAP species which has undergone a large decline in abundance and distribution estimated to be >50% in the UK over the last 25 years. Since the 1970's it has undergone the greatest distribution decrease of any UK butterfly and is one of the UK's most threatened butterfly species. Populations have recently collapsed on Exmoor and on the Herefordshire Commons. Its two remaining national strongholds are now south-west England (Devon and Cornwall) and the Morecambe Bay Limestones. The high brown fritillary remains a high priority for conservation action and its future in many areas is by no means certain (Fox *et al*., 2006).

2. Current Status
2.1 Ecology and habitat requirements
The high brown fritillary forms discrete colonies that rarely contain more than a few hundred adults. However, the adults are highly mobile and are often seen feeding on flowers 1-2km away from main breeding areas. The two main habitats used are bracken dominated habitats or grass/bracken mosaics, and limestone rock outcrops usually where scrub or woodland has been cleared or coppiced. Formerly the butterfly occurred in woodland clearings (such as in the Wyre Forest) probably where bracken was also present. *Viola riviniana* common dog-violet is used in all habitats with *V. hirta* hairy violet also being used in limestone areas (Asher *et al.,* 2001).

2.2 Population and distribution
The butterfly occurs widely through Europe and across temperate Asia to Japan. Although locally abundant in Europe, it has declined in at least eight countries. In England and Wales it is now reduced to around 50 sites (Fox et al., 2006). There are scattered records throughout the west and north of the county, plus one isolated record in the east (figure 1). Most of these are historical data. Between 1995 and 2003 the butterfly was recorded in only the Wyre Forest and the Malvern Hills. It is now thought to be restricted entirely to the Malvern Hills, with numbers recorded here falling to a low of 2 in 2000. However, there were an encouraging 20 confirmed sightings on the Malvern's in 2006 (Joy, 2007).

2.3 Legislation
The high brown fritillary is listed in Schedule 5 of the Wildlife and Countryside Act.

2.4 Summary of important sites
The Malvern Hills form one of the largest areas of semi-natural vegetation in the West Midlands supporting a mosaic of habitat types, including acid grassland, scrub, woodland and some small areas of heathland. The lower slopes are dominated by bracken and western gorse and the flora under the bracken contains many early

flowering species more typical of woodland, including the violet food-plants of the high brown fritillary. Other notable Lepidoptera found on the hills include *Hipparchia semele* grayling and *Minoa murinata* drab looper as well as species that are uncommon in the West Midlands such as *Argynnis paphia* silver-washed fritillary, *Satyrium w-album* white letter hairstreak and *Erynnis tages* dingy skipper. A number of nationally scarce moth species occur such as *Euxoa obelisca* square-spot dart, *Egira conspicillaris* silver cloud and *Chesias rufata* broom-tip.

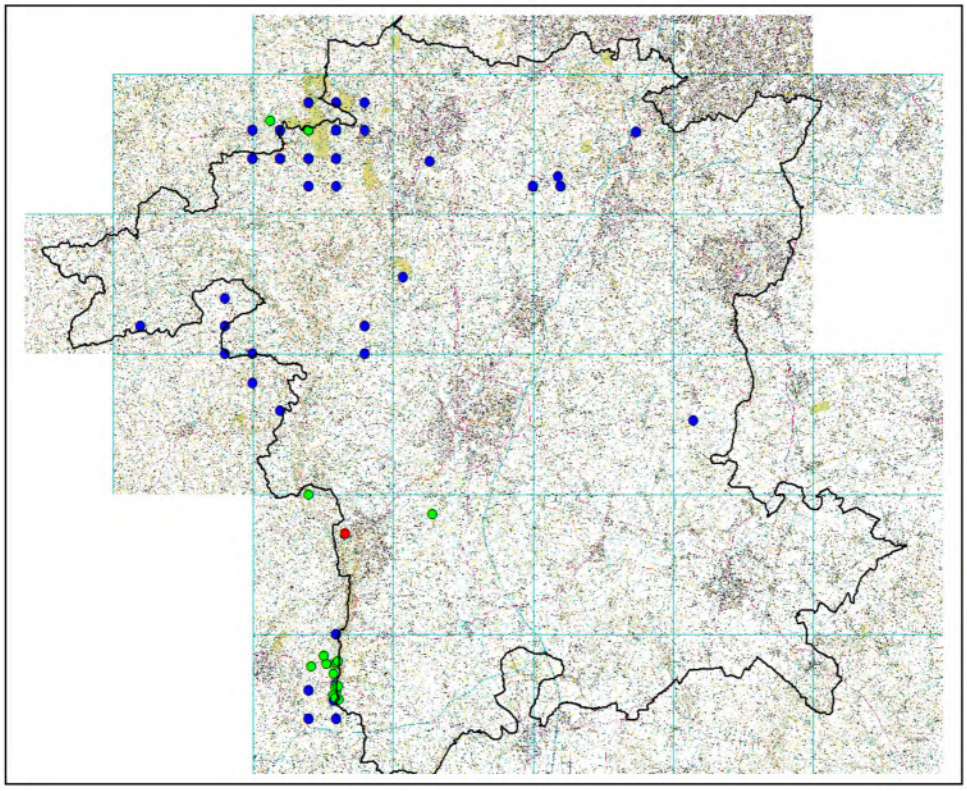

Figure 1. Records for high brown fritillary in Worcestershire to 2007. Records pre-1979 are shown blue, 1980-1999 shown green and 2000-2007 shown red. Data provided by Worcestershire Biological Records Centre. *Note some data is displayed at hectad level*.

3. Current Factors Affecting the Species

- Lack of grazing/changes in grazing levels in priority areas of habitat impacting on the abundance of the main food plant or scrubbing up of previously open areas.
- Lack of nectar sources (possibly due to thistle cutting).
- Low population size limits the butterfly's ability to take advantage of any new areas of habitat that are created.

4. Current Action

4.1 Local protection

The Malvern Hills are a designated Area of Outstanding Natural Beauty and receive protection under the National Parks and Access to the Countryside Act 1949 and the Countryside and Rights of Way Act 2000.

4.2 Site management and programmes of action

- The 'High Brown Hills Project' implemented by the Malvern Hills Conservators and others has enabled many areas of the Malvern Hills to be grazed by cattle and sheep to optimize the bracken/open grassland habitat available for the butterfly. While there is little doubt that this project will continue to bring benefits for Lepidoptera, there are still a number of areas where grazing has yet to be established (several of these being areas where high brown fritillary habitat is still present).
- Bracken management continues to be carried out by the Malvern Hills Conservators. This has involved summer cutting regimes (in blocks or paths) and/or winter raking up of bracken litter and scrub clearance.
- The "Bracken for Butterflies" leaflet produced by Butterfly Conservation was revised and reprinted in 2005.
- Management work targeted at improving key high brown fritillary breeding habitat has recently been carried out on one privately owned site where the butterfly can still be found.

4.3 Survey, research and monitoring

- Extensive vegetation monitoring was carried out in the Malvern Hills in 2004 and 2005 using established techniques to locate remaining high brown fritillary breeding areas and to provide a baseline for future work (Clarke, 2005; Clarke & Joy, 2006**).** This work also identified management needs for key high brown fritillary sites in the Malvern Hills.
- The high brown fritillary continues to be monitored by Butterfly Conservation volunteers in the Malvern Hills area through a combination of butterfly transects and targeted adult searches in key areas.

5. Associated Plans

Scrub, Woodland, Acid Grassland, Neutral Grassland, Calcareous Grassland.

6. Vision Statement

To turn around the fortunes of this butterfly in the Malvern Hills and increase the number of occupied sites so it is less vulnerable to extinction.

To continue with the monitoring programme of both this butterfly and its habitats with support from local volunteers.

To seek and secure further funding to continue Lepidoptera conservation work on the Malvern Hills.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Population	Double the size of the high brown fritillary population in the Malvern Hills (or increase the number of occupied 1km squares)	20 adults	40 adults	2012
Population	Encourage the high brown fritillary population to continue to increase above the 2012 level.	40 adults	50	2017
Range	Increase the existing range of the high brown fritillary so that at least two of its former sites in the Malvern Hills are re-colonised.	1 site	3 sites	2012
Range	Encourage the high brown fritillary range to increase beyond the 2012 level.	3 sites	5 sites	2017

8. Action

Action Code	Action Category	Action Text	Location	Complete Action By	Lead organisation	Support organisation
WRC HBF AP 01	**1.6**	Ensure that relevant species policy is included in AONB Management Plans.	Malvern Hills	2017	AONB Partnership	
WRC HBF CA 01	**2.13**	Continue annual liaison with managers of past and present sites for the high brown fritillary to ensure existing breeding habitat is maintained and enhanced.	Malvern Hills	2017	MHC	BC AONB Partnership NT
WRC HBF CA 02	**2.12**	Distribute 50 copies of the revised Bracken for Butterflies leaflet to landowners with existing suitable habitat or where suitable habitat could be created.	Malvern Hills	2010	BC	MHC FWAG AONB Partnership
WRC HBF CP 01	**3.16**	Maintain liaison with key landowners and managers to provide an annual update on the status of the high brown fritillary population and any autecological research results.	Malvern Hills	2017	BC	MHC AONB Partnership NE

WRC HBF CP 02	**3.5**	Produce at least one press release on the current status of the high brown fritillary in the Malvern Hills.	Malvern Hills	2010	BC	MHC AONB Partnership
WRC HBF HC 01	**7.4**	Look for further opportunities for bringing additional sites into suitable management for the high brown fritillary.	Malvern Hills	2010	BC	MHC AONB Partnership NT FWAG
WRC HBF SU 01	**13.4**	Ensure annual monitoring of the high brown fritillary by transects and timed counts continues.	Malvern Hills	2017	BC	
WRC HBF SU 02	**13.2**	Repeat assessment of high brown fritillary breeding habitat to determine if management is effective.	Malvern Hills	2010	BC	MHC AONB Partnership

MHC – Malvern Hills Conservators **NE** – Natural England **BC** – Butterfly Conservation
FWAG – Farming and Wildlife Advisory Group **NT** – National Trust
AONB Partnership – Area of Outstanding Natural Beauty Partnership (Malvern Hills office)

References and further information

Asher, J., Warren, M., Fox, R., Harding, P., Jeffcoate, G. and Jeffcoate, S. 2001. The Millennium Atlas of Butterflies in Britain and Ireland. Oxford University Press.

Clarke, S. A. 2005. High Brown Fritillary Breeding Habitat Survey 2004: Malvern Hills. Butterfly Conservation Report No. SO5-05.

Clarke, S. A. & Joy, J. 2006. Fritillary Survey 2005: Malvern Hills. Butterfly Conservation Report No. SO6-11.

Fox, R., Asher, J., Brereton, T., Roy, D. and Warren, M. 2006. The State of Butterflies in Britain and Ireland. Pisces Publications.

Joy, J. 2007. High Brown Fritillary sightings in the West Midlands Region Summary 2006. Confidential Report by Butterfly Conservation.

Brown Hairstreak
Thecla betulae
Species Action Plan

1. Introduction
The brown hairstreak was once fairly widespread in England and Wales but has declined in Britain by 43% in the last 3 decades due to the loss of woodlands and hedgerows and the widespread practice of annual flailing of hedgerows. The serious national decline in distribution since the 1970's makes the butterfly a priority UK BAP species.

2. Current Status
2.1 Ecology and habitat requirements
The brown hairstreak is an elusive butterfly that lays its eggs on suckering *Prunus spinosa* blackthorn along hedgerows and woodland margins, rides and clearings. The eggs are laid at the base of the spines or at junctions between branches during August to October and remain as eggs throughout the winter months making them very susceptible to winter flailing. Sunny, sheltered positions are favoured for egg-laying. The caterpillars emerge in the following April / May and continue to feed on blackthorn until they pupate in early July. The chrysalis is formed close to the ground amongst leaves and is sometimes tended by ants. Colonies are normally centred on a wood, but egg-laying usually extends over several square miles of the surrounding countryside. A complex of woodlands and hedgerows with abundant, suitably managed blackthorn is therefore required. Most colonies occur on heavy clay soils where blackthorn is dominant in the constituent hedgerows. The adults also require mature trees, so called 'master or assembly trees', where they gather at the top to mate and feed on aphid honeydew. *Fraxinus excelsior* ash trees are generally preferred either along a woodland edge or within a hedgerow.

2.2 Population and distribution
The butterfly currently has strongholds in four main areas of Britain: the heavily wooded clays of the west Weald in West Sussex and Surrey; the sheltered low-lying valleys of North Devon and south-west Somerset; low-lying pastoral areas of south-west Wales; and in Ireland on the limestone pavements of the Burren and lowland areas to the east including Gort and Clarinbridge.

The colony in and around Grafton Wood and surrounding nearby woodlands in Worcestershire is the only colony in the West Midlands and now provides a thriving stronghold for the species. The known area now stretches from Trench Wood in the west to the Warwickshire border in the east and from Naunton Beauchamp in the south to Hanbury in the North (figure 1). Concerted conservation and recording effort by local volunteers over the last 3 decades have seen a significant increase in the size and known distribution of this population. From just **16** 1km squares in 1994 the known distribution had grown to **54** 1km squares by 2005 and to **111** 1km squares in 2006. At the time of writing (March 2007), the number of known squares stands at **135**. However, the butterfly is still threatened by inappropriate hedgerow and woodland management and conservation effort needs to be maintained if the trend in population expansion is to continue.

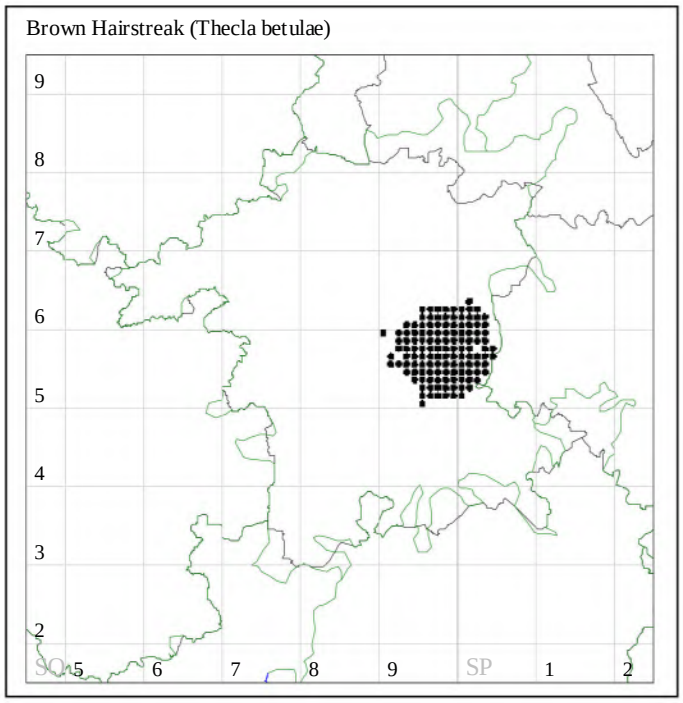

Figure 1. Brown hairstreak distribution in Worcestershire to 2007 (occupied 1 km squares). Data provided by Butterfly Conservation.

2.3 Legislation

The butterfly is listed in schedule 5 of the 1981 Wildlife and Countryside Act.

2.4 Summary of important sites

Grafton Wood SSSI is owned by Worcestershire Wildlife Trust and jointly managed with Butterfly Conservation and is the largest of the remnants of the Feckenham Forest. After a period of assumed extinction in Worcestershire, the butterfly was rediscovered in the orchard adjacent to the woods in 1970. The wood is thought to be the centre of the recolonisation by brown hairstreak of the surrounding countryside as increased awareness has led to better management practices in woodland and hedgerow management for the species. A regular work party at Grafton Wood undertakes management and planting of blackthorn and ride clearance. In 2004/5 the population was continuing to increase with a count of 175 eggs in the wood.

Roundhill Wood has been sympathetically managed by the landowner for a number of years with a resulting increase in the brown hairstreak population. Egg counts for 2006/7 were the highest ever with 288 eggs counted.

Trench Wood SSSI was a known site for brown hairstreak in Victorian times but has only recently been shown to hold a modern day population. This site is also managed jointly by Worcestershire Wildlife Trust and Butterfly Conservation. Work is continuing to map the occurrence of eggs within the wood and further blackthorn planting is planned.

3. Current factors affecting the species

- **Annual flailing of hedgerows -** flailing hedgerows during the winter will destroy any eggs laid the previous summer/autumn. To avoid this, hedgerows should be cut on rotation cutting no more than one 1/3rd of the hedgerow in a single year.

- **Inappropriate woodland management -** neglect of woodland, particularly lack of management of the more open areas such as glades and rides where the larval foodplant is present, is likely to impact on the brown hairstreak. The same applies to woodland edge habitat where ideally any blackthorn should be coppiced on a short rotation.

- **Stock and deer browsing of blackthorn re-growth -** the build up of deer numbers, especially non-native species such as *Muntiacus reevesi* muntjac, is detrimental to blackthorn re-growth and numbers should be controlled. Where important breeding habitats are adjacent to fields used regularly by grazing stock consideration should be given to the use of fencing to protect young suckering blackthorn, which is favoured for egg-laying.

- **Chemical spraying of hedge-bottoms or pesticide drift –** this is a particular problem where landowners are seeking to control or prevent suckering blackthorn. Chemical application will decrease availability of the suckering growth often favoured by the butterfly and pesticides will destroy eggs and caterpillars.

4. Current Action

4.1 Local protection

Grafton Wood, the centre of the Worcestershire Brown Hairstreak population, is designated a SSSI and managed jointly by Butterfly Conservation and Worcestershire Wildlife Trust. Recent searches have confirmed the butterfly's presence at several other Worcestershire Wildlife Trust reserves: Long Meadow, Trench Wood SSSI (also jointly managed with Butterfly Conservation), Feckenham Wyle Moor SSSI and Humpy Meadow.

4.2 Site management and programmes of action

Butterfly Conservation have been liaising with DEFRA to ensure that landowners farming within the area central to the butterfly's population are aware of the species' habitat requirements. A number of local landowners have entered into Environmental Stewardship schemes with hedgerow management for brown hairstreak as a key component of their agreements.

Blackthorn planting took place at Trench Wood in winter 2006 following the sighting of brown hairstreak adults and the subsequent discovery of eggs.

The Brown Hairstreak Local Champions project has been running since 2002, pump-primed with Awards for All money. There is an annual programme of activities including egg-hunts and brown hairstreak larval searches to train and encourage new volunteers. A leaflet has been produced by Butterfly Conservation to encourage more involvement with the Local Champions project and there is a return slip to request further help and advice on management for the species.

Free blackthorn has been provided to local landowners to encourage them to learn about the butterfly and report sightings but also to expand the area of suitable egg-laying habitat.

Grafton Wood and Trench Wood have a monthly work party which helps to improve the habitat for the butterfly through ride clearance, coppicing, planting new blackthorn and deer fencing.
The Vision Mapping Project recently completed by Worcestershire Biodiversity Partnership was very successful in helping to engage the local community and schools in the conservation of the brown hairstreak.

4.3 Survey, research and monitoring
Research on egg-laying and caterpillar development is undertaken by volunteers through annual timed egg counts and the later monitoring of the movements of caterpillars on hedgerows at Grafton Wood. The timed count survey was initiated in 1969 and is still undertaken each year under the co-ordination of Mike Williams, to determine changes in the population year on year.

A survey of blackthorn distribution at Trench wood is planned for 2007.

5. Associated Plans
Woodland, Ancient / Species-rich Hedgerows, Scrub.

6. Vision Statement
That the core breeding area of the butterfly (including Grafton Wood, Roundhill Wood and surrounding field hedgerows) continues to be well managed and protected from damaging practices. That population numbers and distribution of the butterfly continue to grow and are monitored and studied by a supportive local community to continue to improve our knowledge of the ecology and habitat requirements of the species.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Range	Increase the population range	111 occupied squares in winter 2005/06	150 occupied squares	2012
Range	Encourage the planting of new hedgerows with at least 60% native blackthorn in the core butterfly population area	0	1 km of new Blackthorn hedging	2010

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead organisation	Support organisations
WRC BHB CA 01	**2.13**	Ensure that all owners / managers of woods and farmland within 20 km of Grafton Wood receive information on specific management for the brown hairstreak	Forest of Feckenham	2010	BC	NE FWAG WWT
WRC BHB CA 02	**2.11**	Develop a strategy for ensuring that tree / hedgerow management contractors have appropriate information on habitat management for brown hairstreak and the location of key hedgerows to reduce the incidence of accidental damage of eggs.	Worcestershire	2010	BC	
WRC BHB CP 01	**3.15**	20 email newsletters to go to local residents and other interested bodies on a bi-annual basis.	Forest of Feckenham	2017	BC	
WRC BHB CP 02	**3.4**	Run 40 events to increase local public awareness of and participation in survey and conservation activities for brown hairstreak.	Forest of Feckenham	2017	BC	
WRC BHB ID 01	**8.1**	Continue to keep up-to-date map of important hedgerows and make available to DEFRA.	Worcestershire	2017	BC	
WRC BHB RE 01	**10.1**	Continue to further study the ecology and life cycle of the species in order to better understand habitat needs.	Worcestershire	2017	BC	
WRC BHB SM 01	**12.1**	Achieve/maintain favourable habitat management for brown hairstreak at Grafton,	Wood	2017	BC WWT	

		Roundhill and Trench Woods.				
WRC BHB SU 01	**13.4**	Carry out annual egg count monitoring to provide baseline data of population changes.	Grafton Wood	2017	BC	
WRC BHB SU 02	**13.4**	Develop a wider system of key hedgerow monitoring to determine impacts of management on egg numbers.	Forest of Feckenham	2010	BC	

BC - Butterfly Conservation **WWT** – Worcestershire Wildlife Trust **NE** – Natural England
FWAG – Farming and Wildlife Advisory Group

References and further information

Bourn, N. A. D & Warren, M.S. 1998. *Species action plan Brown Hairstreak Thecla betulae*. Butterfly Conservation, Wareham.

Asher, J., Warren, M.S., Fox, R., Harding, P., Jeffcoate, G. & Jeffcoate, S. (2001) *Millennium Atlas of butterflies in Britain and Ireland*. Oxford University Press. New York.

Fox, R., Asher, A., Brereton, T., Roy D. & Warren, M. (2006) *Butterfly Conservation and the Centre for Ecology and Hydrology.* Information Press, Oxford.

Joy, Dr J. (In preparation) *West Midlands Regional Action Plan 2004/5*. Butterfly Conservation.

Mabbett, R. & Williams, M (1994) *Brown Hairstreak in Worcestershire*. Unpublished report to English Nature

Williams, M (2006) *Brown Hairstreak on the Move*. Worcestershire Record No

Wood White
Leptidea sinapis
Species Action Plan

1. Introduction
The wood white is a priority UK BAP species due to its distribution and population level declines since the 1970's.

2. Current Status
2.1 Ecology and habitat requirements
The wood white is the smallest of the *White* family of butterflies. It is renowned as the most delicate and slow flying of the British butterflies and this has given it the evocative nickname of "Lady of the Woods". It is usually encountered in sheltered situations such as woodland rides and clearings and scrub edges. The wood white can also breed on coastal undercliffs, disused railway lines and around rough overgrown field edges. In Worcestershire the known breeding sites are all in woodland.

In Britain the wood white traditionally bred in ancient deciduous woodland that had a long history of coppicing. The number of wood white colonies rapidly declined in size and number as traditional coppicing ceased at most woodland sites. In the second half of the twentieth century there was a brief renaissance in the butterfly's fortunes as it moved to colonise a wider range of habitats including young conifer plantations planted on clear felled ancient woodland sites and disused railway lines following closure. Unfortunately the conifer plantations grew rapidly and disused railway lines soon scrubbed up causing a further round of extinctions. The butterfly will only breed in sunny open rides or recent coppice areas that are lightly shaded (20-50% Canopy Cover) by the surrounding trees. In woods where the species survives, colonies tend to be concentrated in rides running between young crops or young coppice plots.

The growth structure of the butterfly's four known larval foodplants is the critical factor in the butterfly's survival. Larval foodplants of the wood white are *Lathyrus pratensis* meadow vetchling, *Vicia cracca* tufted vetch, *Lathyrus linifolius* bitter vetch, *Lotus corniculatus* common bird's-foot-trefoil and *L. pedunculatus* greater bird's-foot-trefoil. For any of these foodplants to be used they must grow through and protrude above the surrounding vegetation and in less than 50% shade conditions.

2.2 Population and distribution
The butterfly has a very localised distribution in England and Wales and declined substantially during the 20th century due mainly to the decline in traditional woodland management. By the 1900's the butterfly was extinct in several counties, including several where it had once been abundant. There are now approximately 70 colonies left in England and Wales. The butterfly's British strongholds are currently in three main regions: Herefordshire, Shropshire and Worcestershire; Northamptonshire and Buckinghamshire; Devon and south Somerset.

National Status

The national distribution trend for the species (1972-82 versus 1995-2004) shows a decline of 165% and a long-term population trend (1977-2004) of -64%. The species is confined to the southern half of the UK and throughout Ireland (Fox *et al.* 2006).

Regional Status

The species is listed as High Priority in Butterfly Conservation's West Midlands Regional Action Plan. The species continues to have a national stronghold in the region even though it is still undergoing decline in some areas. It was recorded in 56 regional tetrads between 1995 and 2003. It is usually associated with woodland habitats where it breeds in open rides and clearings. It has declined severely due to the decline of traditional woodland management. Where conservation work has been undertaken (widening of rides, coppicing, establishing mowing rotations etc), it has responded positively (Joy, unpub.).

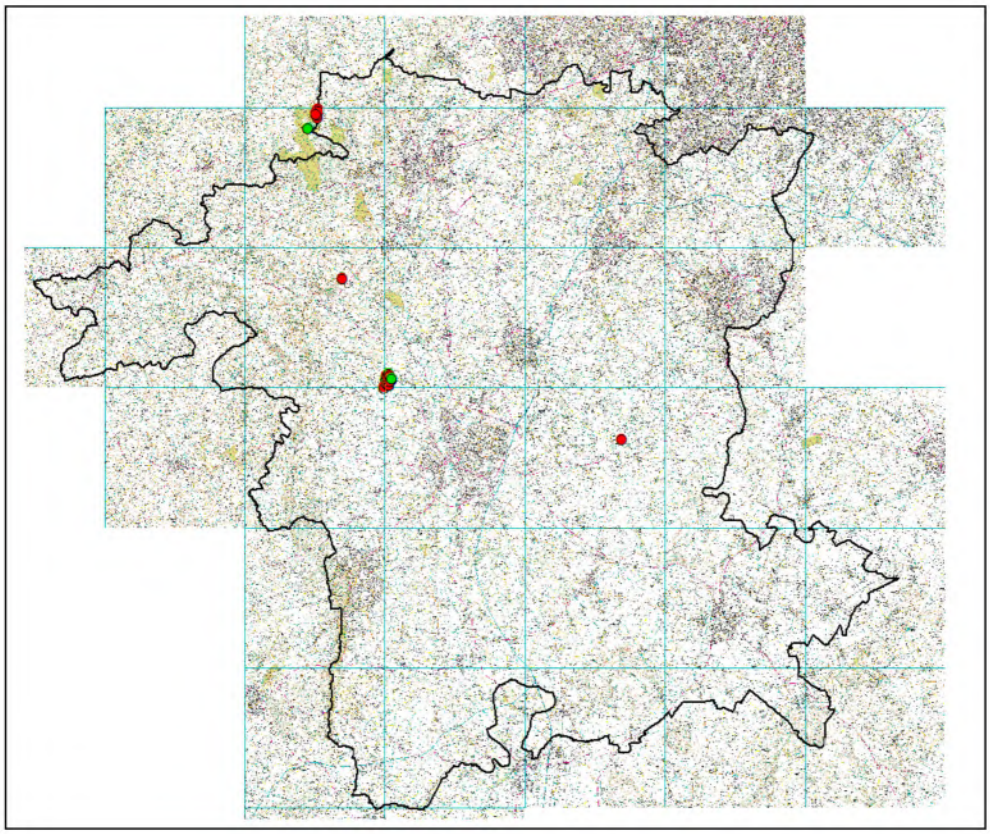

Figure 1. Records for wood white in Worcestershire. Records 1990-1999 shown green, 2000-2007 shown red. Data provided by Butterfly Conservation. ***Note some data is displayed at tetrad level.***

Worcestershire Status

Wood white was recorded in 9 tetrads between 1995 and 2002 (figure 1). Most remaining colonies are in the west of the county and are small. Shavers End Quarry and adjacent Ramscoombe Coppice support good numbers (Bucknall, *pers. com*). As wood white have also recently been recorded on two other sites nearby (Abberley Hill and South West of Walsgrove Hill), this area of Worcestershire must now be

considered to be important for this species. Elsewhere in Worcestershire the only extant medium / large population is at Monkwood, but this seems to have declined in recent years. Formerly, a colony occurred at Little Goosehill Wood, part of the Forest of Feckenham, but this had died out by the late 1980's. A small colony still exists in the Shropshire part of the Wyre Forest with occasional records in Worcestershire from time to time (Joy, 2002).

2.3 Legislation

The butterfly is listed in schedule 5 of the Wildlife and Countryside Act.

2.4 Summary of important sites

The Wyre Forest

All records are from the Dowles Brook corridor and Postensplain areas of the Wyre Forest. There are 21 records for the Dowles Brook corridor, but unfortunately none since 1992, so it appears to have disappeared from this area. At Postensplain, it was recorded regularly with 13 records since 2002, particularly along the stream. The largest recent count was 20 in 2005. There is one record from Areley Wood in 1994 (Grundy, 2006).

Monkwood

Positive management has been undertaken here for several years. The rides are managed with a three-tier structure consisting of a central pathway, an inner margin (flailed every four years on rotation) and an outer coppice margin (managed on a 7 year rotation). Additionally, new areas of coppice are created and cut on varying rotations between 7-20 years (Joy, 1997). The species seems to have declined steadily since 1997 according to the results of the annual transect although the route of the transect is not thought to include the optimum habitat for wood white. The rides at the site may be too shaded with a lack of foodplants. There is scope for more targeted management and monitoring at this site.

Shavers End Quarry

A small colony of wood white occurs in woodland habitat scattered across this large quarry site. On a good day 7-8 individuals can be recorded *(*Bucknall *pers com*). Butterfly Conservation undertook some management on two rides in areas where trees had been clear-felled and replanted by the landowner. As the trees have grown up these rides have become too shaded for the species due to the aspect of the slope. The site is adjacent to Ramscoombe Coppice (see below).

Ramscoombe Coppice.

This wood has records for wood white but there is no active management for the species. The landowner is aware of the presence of wood white on the site.

Penny Hill Bank

There is one record from this site, which is adjacent to Penny Hill Bank, a Worcestershire Wildlife Trust limestone meadow nature reserve.

Grafton Wood

There are records of one or two individuals at this site dating from a few years ago; however, these are thought to be from a release that failed to form a viable colony.

3. Current Factors Affecting the Species

- **Lack of traditional coppice management –** coppice plots connected by rides allow light into woodlands, encourage the growth of suitable foodplants and assist movement of the butterfly from one potential breeding site to another.
- **Isolation of existing suitable woods, combined with the wood white's limited colonising ability.**
- **Continuing decline in the market for coppice products** leading to abandonment of this management practice.
- **Even aged nature of many potential woodland sites,** leading to high shade levels >50%.
- **Lack of woodland management** - insufficient continuity of coppicing programmes or cleared areas situated suitably close to each other and/or connected by wide sunny rides.
- **Inappropriate woodland ride edges management -** too frequent mowing of tal**l** herb edge leading to an absence of appropriate foodplants growing with the right growth structure; where colonies persist in rides 3-4 year mowing of tall herb edge is recommended; good management regimes exist at Wyre Forest.

4. Current Action

4.1 Local protection

A number of the sites where wood white occurs have some form of designation: both the Wyre Forest and Monkwood are SSSI's.

4.2 Site management and programmes of action

- Work parties at Monkwood are undertaking appropriate management and there is an annual species transect.

- In 2007, a SITA Trust funded Project 'Back to Orange' was started in the Wyre Forest. This project will enable conservation management work to be carried out in six areas of the forest over the next three years to improve the habitats for butterflies and moths including the wood white.

4.3 Survey, research and monitoring

- The Back to Orange Project will focus more survey and monitoring effort on the wood white to establish if the butterfly is more widespread in the area than previously thought (as well as how better links between sites could be made).

- Work parties at Monkwood are undertaking appropriate management and there is an annual species transect.

5. Associated plans

Woodland.

6. Vision Statement

To ensure the long-term management of existing colonies and to increase the number of colonies in Worcestershire from 2 to 4 by 2017.

It is envisaged that much of the work carried out for wood white in the Wyre Forest over the next three years will be done through both the SITA Trust 'Back to Orange' Project and the wider HLF funded 'Grow with Wyre' Partnership Scheme.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Range	Increase the number of colonies in Worcestershire	2	4	2017
Range	Increase the number of woodlands under sympathetic management for wood white to restore breeding habitat.	2	8	2017
Range	Increase the number of occupied woods	2	4	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Supporting Organisations
WRC WWH CA 01	**2.13**	Advise owners of sites with known populations on appropriate management for the species.	Worcestershire	2017	BC	
WRC WWH CA 02	**2.12**	Provide advice and support to owners of woodlands adjacent to existing wood white colonies in order to achieve favourable management and create suitable breeding habitat at these additional sites.	Worcestershire	2017	BC	WWT FCE
WRC WWH CA 03	**2.12**	Encourage owners of Ramscombe Coppice to undertake positive management for wood white.	Ramscombe Coppice	2010	BC	WWT
WRC WWH CP 01	**3.16**	Develop and distribute species fact sheets to owners of existing and potential sites for wood white	Worcestershire	2010	BC	FCE
WRC WWH CP 02	**3.5**	Write 5 articles for local media to raise awareness of the decline of the wood white butterfly and its conservation management needs.	Worcestershire	2017	BC	
WRC WWH CP 03	**3.4**	Run 5 events or activities to maintain and increase public awareness of and participation in survey and conservation activities	Worcestershire	2017	BC	

		for the wood white.				
WRC WWH HC 01	**7.2**	Increase the level of management for wood white at Monkwood, targeting effort on ride widening and extending areas of coppice.	Monkwood	2008	BC	WWT
WRC WWH HC 02	**7.2**	Double the area of suitable habitat at Shavers End Quarry and Ramscombe Coppice.	Shaver's End Quarry and Ramscombe Coppice	2012	BC	
WRC WWH HC 03	**7.4**	Investigate the feasibility of introducing wood white into identified areas or networks of habitat patches if these are suitably restored.	Worcestershire	2012	BC	
WRC WWH HS 01	**6.14**	Produce a management plan for Shaver's End Quarry and seek support for implementation from the landowner.	Shaver's End Quarry	2010	BC	
WRC WWH RE 01	**10.1**	Conduct further study on the ecology and life cycle of the species in the region in order to better understand habitat needs.	Worcestershire	2010	BC	
WRC WWH SM 01	**12.1**	Maintain the area of habitat under favourable management for wood white.	Wyre Forest	2017	BC	FCE
WRC WWH SU 01	**13.2**	Undertake a baseline species survey and habitat condition assessment at Shavers End Quarry.	Shaver's End Quarry	2010	BC	
WRC WWH SU 02	**13.2**	Carry out habitat condition assessment of all suitable locations in the vicinity of existing colonies to assess opportunities for recolonisation.	Worcestershire	2012	BC	
WRC WWH SU 03	**13.4**	Undertake annual habitat assessment and timed counts.	Monkwood and the Wyre Forest	2017	BC	FCE NE

BC – Butterfly Conservation	**FCE** – Forestry Commission England
NE – Natural England	**WWT** – Worcestershire Wildlife Trust

References and further information

Asher, J., Warren, M.S., Fox, R., Harding, P., Jeffcoate, G. and Jeffcoate, S. (2001) *Millennium Atlas of butterflies in Britain and Ireland*. Oxford University Press, New York.

Fox, R., Asher, A., Brereton, T., Roy, D. and Warren, M. (2006). *The State of Butterflies in Britain and Ireland*. Butterfly Conservation and the Centre for Ecology and Hydrology. Information Press, Oxford.

Grundy, D. (2006). *A list of Significant Species of Lepidoptera recorded in the Wyre Forest*. Report for English Nature.

Joy, Dr J. (In preparation). *West Midlands Regional Action Plan 2004/5*. Butterfly Conservation.

Joy, Dr. J. (2002). *Draft West Midlands Regional Action Plan Update.* Unpublished.

Warren, M.S., and Bourn, N.A.D (2004). *Species Action Plan - Wood White Leptidea sinapis.*

Grizzled Skipper
Pyrgus malvae
Species Action Plan

1. Introduction
The grizzled skipper is a UK BAP species due to the long-term declines in its distribution and abundance. Many remaining grizzled skipper colonies are on brownfield sites, where they are threatened by successional change, redevelopment and landscaping. Conserving the butterfly in these habitats poses a considerable challenge.

2. Current Status
2.1 Ecology and habitat requirements
The grizzled skipper is a characteristic spring butterfly of sparsely vegetated habitats. Its rapid buzzing flight can make it difficult to follow, but it stops regularly either to perch on a prominent twig or to feed on nectar rich flowers. It can then be identified quite easily by the black and white chequerboard patterns that occur on its wings. The larvae feed on a range of foodplants including *Fragaria vesca* wild strawberry and *Potentilla reptans* creeping cinquefoil. Three main types of habitat are used: woodland rides, glades and clearings; unimproved grassland, especially chalk downland but also other calcareous soils including clays; and recently abandoned industrial sites such as disused spoil heaps, mine workings, railway lines and even rubbish tips.

The grizzled skipper needs warm well-structured habitats that are inherently highly dynamic. Sites with south-facing banks are particularly good. Abundant nectar sources are required with a variety of species used including *Taraxacum* sp. dandelion, *Centaurea nigra* knapweed and *Ranunculus* sp. buttercup. Seed heads of around 30-40 cm are used for roosting and knapweed, *Hypericum* sp. St John's wort and *Plantago lanceolata* ribwort plantain are used, as are young *Crataegus monogyna* hawthorn saplings. The butterfly suffered not only form the wholesale loss of semi-natural grassland in lowland Britain during the 20th century, but also from abandonment and changing management of the habitats that remain. It suffered badly from the cessation of traditional woodland coppicing and lack of regular canopy gaps in modern woodland. On industrial and disused railway land it has suffered from the decline of heavy industry and the gradual scrubbing up of these neglected sites.

The grizzled skipper is generally single brooded with adults flying from the end of April- mid June. The eggs are laid singly on foodplants growing in warm positions, next to either bare ground or short vegetation. The larvae build a series of "tents", formed by spinning together the edge of leaves, which protect them as they grow. They leave these shelters only to make brief feeding visits to nearby leaves or move to spin new shelters. As they grow they become more mobile and select lush (nutrient rich) plants growing in taller vegetation or more coarse-leaved plants such as *Rubus fruticosus* bramble. They over winter as pupae amongst low vegetation.

2.2 Population and distribution

The species is listed as High Priority in Butterfly Conservation's West Midlands Regional Action Plan. The species has continued to decline in the region as a whole over the last two decades. In Worcestershire the grizzled skipper has only been recorded in 15 tetrads (figure 1) and most sites are associated with railway cuttings, siding and embankments, spoil heaps and quarries. The two main locations for the butterfly in Worcestershire are the Wyre Forest, now a rare example in the region of the species using its traditional woodland habitat where the butterfly is found mainly on the short sward of the water pipeline and the rocket testing station, and on the disused railway-lines at Honeybourne: here, and on other post-industrial sites, the butterfly utilizes a mosaic of habitat types with areas of bare ground or short turf, some areas of taller herb rich grass and scrub.

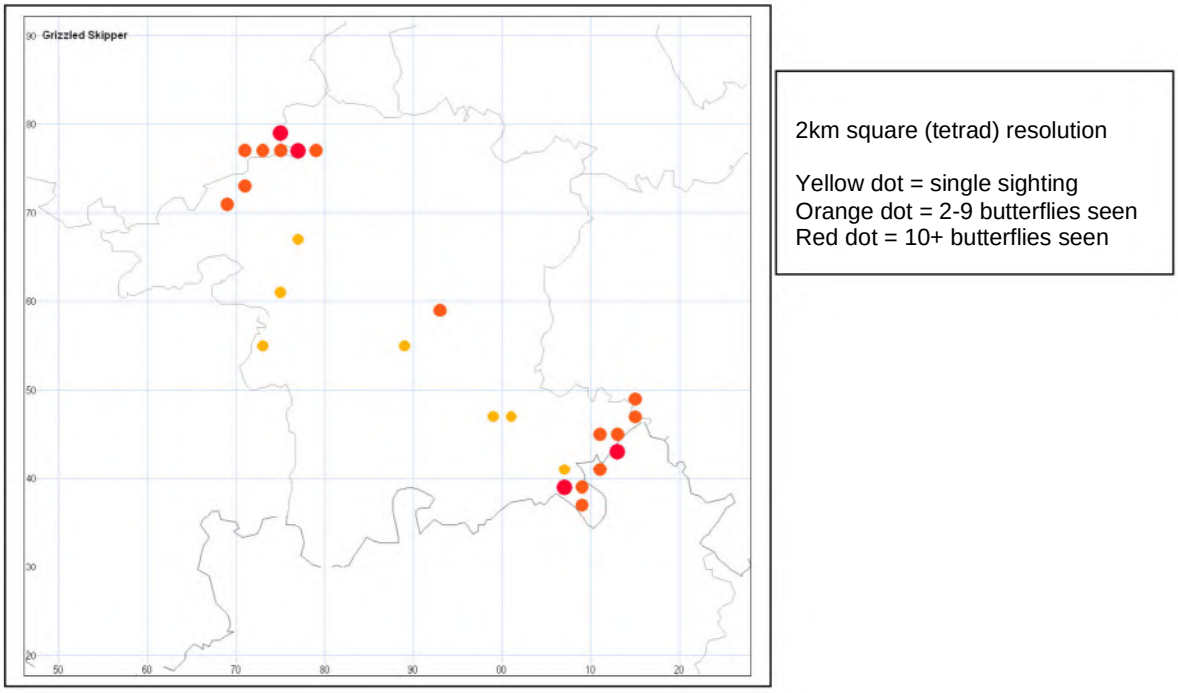

Figure 1. Records for grizzled skipper in Worcestershire 1995-2005. Data provided by Butterfly Conservation.

A desk study by Ellis (2006) found a record from 1997 for Shaver's End Quarry – further investigation of this site may lead to more records. In addition, twelve grizzled skippers were recorded at Throckmorton refuse tip in May 2007. This site has potential for the species but further investigation of the site is again required.

2.3 Legislation

The butterfly is listed in schedule 5 of the Wildlife and Countryside Act.

2.4 Summary of important sites

The Wyre Forest

The grizzled skipper is an uncommon species in the Wyre Forest with past records concentrated in four distinct areas; along the pipe-line at Longdon (18 records), the pipe-line in the Malpass/Breakneck Bank area (six records), the rocket testing site

(ten records) and Bell Coppice (four records) (Grundy, 2006). The butterfly is probably under-recorded here and is likely to get a higher profile through the SITA-funded Back to Orange Lepidoptera project currently being undertaken in the Wyre.

Honeybourne Disused Railway-line

This site is part of the old Cheltenham - Stratford line and is regionally important for its grizzled skipper colonies. A grizzled skipper transect has been undertaken by Butterfly Conservation for the last 12 years: figure 2 shows data from the period 1995-2004. The transect data shows a sharp decline in numbers and the species has disappeared completely from stretches of line where it used to occur until very recently. Grizzled skipper counts at Honeybourne fell from 56 in 1998 to just 14 in 2004 and 2005. Although there is still plenty of creeping cinquefoil present the main problem is scrub encroachment, which is severely reducing the amount of open habitat available to the butterfly. *Chamerion angustifolium* rosebay willowherb is also taking over some of the more open areas.

Butterfly Conservation undertook some urgent conservation work on site in winter 2006 where volunteer work parties carried out scrub clearance work.

The site is owned by Sustrans and managed for access purposes.

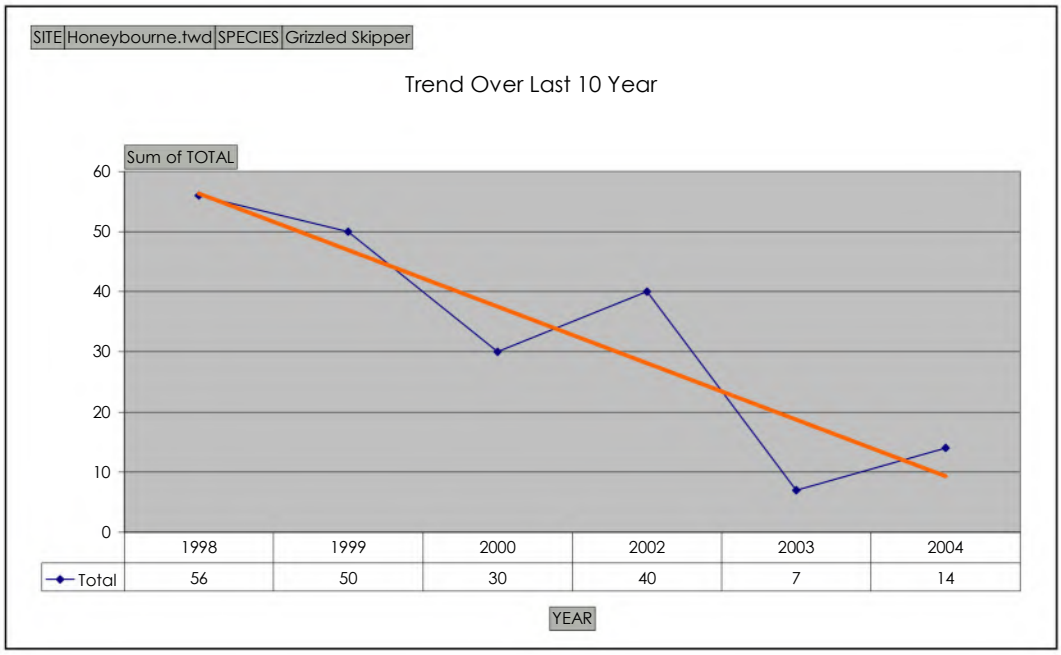

Figure 2. Results of grizzled skipper population transects at Honeybourne 1995-2004. Data provided by Butterfly Conservation.

Throckmorton Refuse Tip

An unconfirmed report was substantiated in May 2007 with 12 individuals recorded on one visit. Butterfly Conservation is currently in correspondence with the waste management company who own and manage the site regarding protection and enhancement measures for the species.

3. Current Factors Affecting the Species

- **Lack of appropriate management** (e.g scrub control, grazing, increasing sward height) leading to a deterioration in habitat quality
- **Overgrazing** (but some sites can be maintained in an appropriate condition by rabbit grazing)
- **Tightening of the sward and loss of bare ground**
- **Re-opening of disused railway-lines**
- **Development of brownfield sites**
- **Fragmentation and isolation of existing colonies and the intensive use of the surrounding agricultural land**. As many of the butterfly's habitats are transient, the species requires either a cycle of continuous management to maintain early successional stages within a site, or the creation of new areas that are colonized as existing ones become unsuitable.

4. Current Action

4.1 Local protection

Much of the Wyre Forest is designated a SSSI, and part of it a National Nature Reserve.

4.2 Site management and programmes of action

- Continued close working between Butterfly Conservation, Forestry Commission England, Natural England and the Wyre Forest Study Group will hopefully result in a management brief being written for one of the four main Wyre Forest sites for the species (the Rocket Site) by the end of 2007.

- Butterfly Conservation has been working with St. Modwen Properties PLC to implement a programme of positive habitat management and restoration for the grizzled skipper at Long Marston in Warwickshire. This 478-acre ex-MOD site, comprising industrial and warehouse units and derelict railway track, links into the northern end of the Honeybourne railway line. If further sections of the Honeybourne line can be opened up (cleared of scrub) and the grizzled skipper colonies here reconnected to the Long Marston site, this would help to significantly boost the stability of the population.

- In 2007, a SITA Trust funded Project 'Back to Orange' was started in the Wyre Forest. This project will enable conservation management work to be carried out in six areas of the forest over the next three years to improve the habitats for butterflies and moths including the grizzled skipper.

4.3 Survey, research and monitoring

- It is anticipated that the HLF funded Wyre Forest Project (Grow with Wyre) will result in more community involvement in the forest in the next few years which will hopefully result in more sustainable long term survey and monitoring for this butterfly.

- The 'Back to Orange' SITA Trust Project will allow survey, monitoring and research work to be focused on the grizzled skipper in the Wyre Forest for the next three years.

5. Associated plans

Woodland, Urban.

6. Vision Statement

To secure the long-term management of all existing colonies

To increase the number of breeding sites within networks of existing habitat through appropriate management.

It is envisaged that much of the work carried out on grizzled skipper in the Wyre Forest over the next three years will be carried out through both the SITA Trust 'Back to Orange' Project and the wider HLF funded 'Grow with Wyre' Partnership Scheme.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Population	Establish four new breeding sites for the butterfly in core population areas of Worcestershire	3	7	2017
Range	Achieve appropriate management on sites outside the core population area of the Wyre Forest that could be reached through natural colonisation in order to increase the potential range of the butterfly	0 sites	2 sites	2017
Population	Restore numbers of the butterfly recorded on the annual transect at Honeybourne to pre-2000 levels	14 adults	50 adults	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC GZS AP 01	**1.1**	Continue to liaise with Sustrans over the appropriate management of disused railway lines where they have the potential to support grizzled skipper.	Worcestershire	2017	BC	
WRC GZS CA 01	**4.1**	Encourage landowners in the vicinity of grizzled skipper colonies to undertake grassland and scrub management that will benefit the species.	Worcestershire	2017	BC	NE FWAG
WRC GZS CA 02	**2.13**	Continue to advise landowners of existing sites on appropriate management for the species.	Worcestershire	2017	BC	
WRC GZS CP 01	**3.16**	Distribute species fact sheets to owners of existing and potential sites for grizzled skipper.	Worcestershire	2010	BC	FCE
WRC GZS CP 02	**3.4**	Hold 5 events to increase public awareness of the species and how to protect and manage its habitat.	Worcestershire	2017	BC	
WRC GZS FR 01	**4.13**	Use local media or other publications to increase public	Worcestershire	2017	BC	

		awareness of the species and appropriate habitat management and to recruit volunteers for involvement in butterfly recording.				
WRC GZS HC 01	**7.4**	Identify potentially suitable, unoccupied habitats with 10 km of existing populations and assess possibility of re-establishment.	Worcestershire	2012	BC	
WRC GZS HC 02	**7.2**	Increase the level of management at Honeybourne to reconnect the colony with those on the Long Marston site.	Honeybourne	2012	BC	
WRC GZS HS 01	**6.12**	All minerals and waste developments to include habitat provision for grizzled skipper within mitigation or restoration schemes as a planning requirement.	Worcestershire	2017	WCC	BC, All District Councils
WRC GZS RE 01	**10.15**	Conduct further research on habitat requirements and management techniques, especially methods of restoring habitat from scrub.	Worcestershire	2017	BC	
WRC GZS SM 01	**12.1**	Expand the area of habitat under appropriate management for the species.	Wyre Forest	2012	BC	FCE NE
WRC GZS SP 01	**11.3**	Designate all current grizzled skipper sites as County Special Wildlife Sites.	Worcestershire	2012	WWT	BC
WRC GZS SU 01	**13.4**	Establish transect route and carry out annual monitoring of population.	Wyre Forest	2017	BC	FCE NE
WRC GZS SU 02	**13.4**	Undertake annual species transect.	Honeybourne	2017	BC	FCE NE
WRC GZS SU 03	**13.4**	Undertake annual habitat assessment and timed counts on areas being managed.	Honeybourne and the Wyre Forest	2017	BC	

BC – Butterfly Conservation **NE** – Natural England **FCE** – Forestry Commission England
WCC – Worcestershire County Council **FWAG** – Farming and Wildlife Advisory Group

References and further information

Asher, J., Warren, M.S., Fox, R., Harding, P., Jeffcoate, G. & Jeffcoate, S. (2001) Millennium Atlas of butterflies in Britain and Ireland. Oxford University Press. New York.

Ellis, J. (2006) Brownfield Sites of Importance for Butterflies and Moths in the West

Grundy, D. 2006. A list of Significant Species of Lepidoptera recorded in the Wyre Forest. Report for English Nature

Fox, R., Asher, A., Brereton, T., Roy D. & Warren, M. (2006) The State of Butterflies in Britain and Ireland. Butterfly Conservation and the Centre for Ecology and Hydrology. Information Press, Oxford.

Joy, Dr J. (In preparation) West Midlands Regional Action Plan 2004/5. Butterfly Conservation.

T.M Brereton, N.A.D Bourn and M.S Warren (1998). “Species Action Plan” Grizzled Skipper *(Pyrgus malvae).*

Pearl-bordered Fritillary
Boloria euphrosyne
Species Action Plan

1. Introduction
Pearl-bordered fritillary is a priority UK BAP species.

2. Current Status
2.1 Ecology and habitat requirements
The pearl-bordered fritillary is one of the earliest fritillaries to emerge and can be found as early as April in woodland clearings or rough hillsides with bracken where it feeds on spring flowers such as *Ajuga reptans* bugle. The most widely used larval foodplants are *Viola riviniana* common dog-violet and *V. reichenbachiana* early dog-violet. In all habitats it requires abundant larval foodplants growing in short, sparse vegetation where there is abundant leaf litter (Asher *et al*., 2001).

2.2 Population and distribution
The pearl-bordered fritillary is widespread across Europe from northern Spain to Scandinavia and eastwards to Russia and Asia. It appears to be stable in many Europeans countries but has undergone serious declines in some places (e.g. Belguim and Denmark >50% decrease in 25 years). In Britain, the pearl-bordered fritillary is one of our most rapidly declining species with >50% decline estimate for the last 25 years in both abundance and range. The results of a national targeted survey for pearl-bordered fritillary in 2004 suggested that the number of breeding colonies in England had declined by 33% in seven years (1997-2004), and that since 1997 the species has become extinct in Somerset, Dorset and Kent (Fox et al., 2006). There are now only thought to be 170 colonies of this butterfly surviving across all of England (Fox *et al*., 2006).

One of the nationally important strongholds for the pearl-bordered fritillary is the Wyre Forest where there are at least 21 sites that have recently supported this species on the Worcestershire/Shropshire border (Joy, 2002). No other former Worcestershire sites are currently known to support this species (Harper & Simpson, 2001).

2.3 Legislation
The pearl-bordered fritillary is listed on Schedule 5 of the 1981 Wildlife and Countryside Act.

2.4 Summary of important sites
The **Wyre Forest** is one of the largest ancient semi-natural woodlands in Britain extending to over 2,400 hectares. Approximately half of the forest is in Shropshire and half in Worcestershire. Large areas are managed by Forestry Commission England and Natural England with the remainder being privately owned. The Wyre Forest has one of the largest Lepidoptera species lists for any site in Britain with just short of 1,200 species having been recorded. This represents nearly half of the total

number of species recorded in Britain (Grundy, 2006). The Wyre Forest has been and continues to be a well known stronghold for a significant number of nationally and regionally important butterflies and moths such as *Boloria selene* small pearl-bordered fritillary, *Argynnis paphia* silver-washed fritillary, *Pechipogo strigilata* common fan-foot, *Hypomecis roboraria* great oak beauty, *Angerona prunaria* orange moth and the dead wood specialist moths *Schiffermuellerina grandis* and *Oecophora bractella*. The reason for this incredible diversity is the forest's historical management, large size and the subsequent mosaic of habitats present.

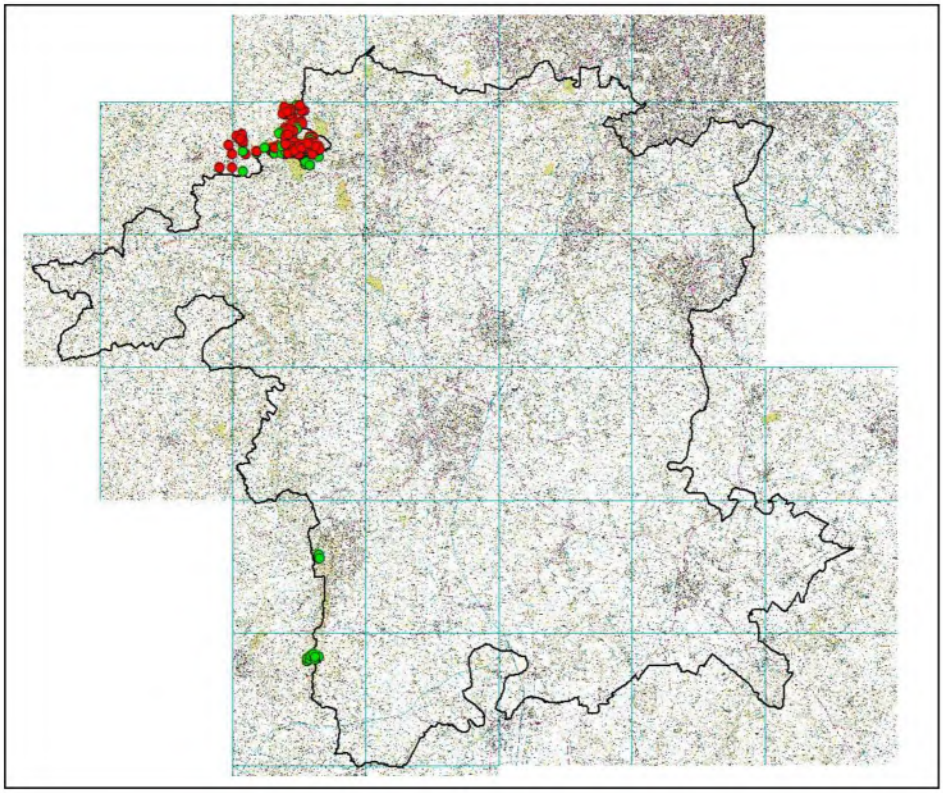

Figure 1. Distribution of the pearl-bordered fritillary in Worcestershire. Records 1990-1999 shown green, 2000-2007 shown red. Data provided by Butterfly Conservation. *Note some data is displayed at hectad and tetrad level.*

3. Current Factors Affecting the Species

Nationally and locally the species has suffered losses to:

- Changes in woodland management.
- Continuing decline in the market for coppice products.
- Changes in bracken management.
- Fragmentation of existing habitats and potential habitats.

4. Current Action

4.1 Local protection

Large parts (over 1700 hectares) of the Wyre Forest are a Site of Special Scientific Interest (SSSI). 500 hectares is designated a National Nature Reserve.

4.2 Site management and programmes of action

- Various management techniques are currently being employed to maintain the pearl-bordered fritillary in the Wyre Forest. They include coppicing, bracken rolling, ride-edge management and the opening up of new areas on land managed by both Natural England and Forestry Commission England.

- In 2007, a SITA Trust funded Project 'Back to Orange' was started in the Wyre Forest. This project will enable conservation management work to be carried out in six areas of the forest over the next three years to improve the habitats for butterflies and moths including the pearl-bordered fritillary.

4.3 Survey, research and monitoring

- A targeted survey of the Wyre Forest for pearl-bordered fritillary adults took place in 2002. Based on these survey results a timed count monitoring programme was established and has been carried out on at least 10 sites on an annual basis (Joy, 2002, 2003a, 2004, 2005 and 2006).

- Six areas were found to support pearl-bordered fritillary larvae during a breeding habitat survey carried out in the Wyre Forest during 2003 (Joy, 2003b).

- Transect monitoring for this butterfly by Butterfly Conservation volunteers has taken place weekly from April to September in two areas of the Wyre Forest: the Wyre Forest East transect since 1979 and the Wyre Forest West transect since 1989.

- Survey of the suitability of Forest Enterprise scallops for pearl-bordered fritillary was carried out in 2003 (Joy, 2003c).

- The 'Back to Orange' SITA Trust Project will allow survey, monitoring and research work to be focused on the pearl-bordered fritillary at the Wyre Forest for the next three years.

- A landscape scale re-introduction programme began in 2006 in the Forest of Feckenham area of Worcestershire following on from habitat assessment surveys of a number of woodlands where coppicing has been reintroduced (Barker, 2002). Captive stock were set up from wild Wyre Forest stock (Joy, 2006).

5. Associated Plans

Woodland.

6. Vision Statement

To ensure land managers in Worcestershire continue to be aware of the presence of this butterfly in the Wyre Forest area so that appropriate management can be undertaken and all populations can be conserved and enhanced.

To continue with the existing monitoring programme and extend it to cover all sites where this butterfly has recently been recorded so that these results can continue to inform site management advice.

To involve more local people in monitoring work for this butterfly.

To continue with the captive breeding programme for the Forest of Feckenham re-introduction.

7. Target

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Range	Increase the number of sites occupied by pearl-bordered fritillary in the Wyre Forest.	21 occupied sites	25 occupied sites	2012
Range	Increase the number of privately owned sites outside of the core Wyre Forest area that are under management appropriate to encouraging the natural colonisation of pearl-bordered fritillary.	3 sites	6 sites	2017
Population	Support a re-introduction programme in the Forest of Feckenham area and increase the numbers of adult pearl-bordered fritillary recorded in the county during annual transects.	22 adults on one site	150 adults on three sites	2012

8. Actions

Action Code	Action Category	Action Text	Location	Action Timescale	Lead Organisation	Support Organisations
WRC PBF CA 01	**2.15**	Run two training events for local volunteers to enable them to help with survey work and monitoring programmes for this butterfly.	Wyre Forest	2012	BC	FCE NE WFSG WWT
WRC PBF CP 01	**3.11**	Maintain annual liaison with key landowners and managers to provide updates on the status of the pearl-bordered fritillary populations.	Wyre Forest	2017	BC	NE FCE WWT
WRC PBF CP 02	**3.5**	Produce at least one press release on the current status of the pearl-bordered fritillary in the region.	Wyre Forest	2012	BC	NE FCE WFSG
WRC PBF HC 01	**6.1**	Achieve appropriate management for pearl-bordered fritillary on all of its known sites.	Wyre Forest Forest of Feckenham	2012	BC	NE FCE WWT
WRC PBF SU 01	**13.4**	Carry out annual transect survey.	Wyre Forest	2017	BC	NE FCE WFSG WWT

WRC PBF SU 02	**13.4**	Expand the timed count monitoring to cover all sites with confirmed records in the Wyre Forest area.	Wyre Forest area	2012	BC	NE FCE WWT WFSG
WRC PBF SU 03	**13.4**	Carry out an annual monitoring programme of the pearl-bordered fritillary re-introduction attempt.	Forest of Feckenham	2012	BC	WWT

NE – Natural England **BC** – Butterfly Conservation **FCE** – Forestry Commission England
WWT – Worcestershire Wildlife Trust **WFSG** – Wyre Forest Study Group

References and further information

Asher, J., Warren, M., Fox, R., Harding, P., Jeffcoate, G. and Jeffcoate, S. 2001. The Millennium Atlas of Butterflies in Britain and Ireland. Oxford University Press.

Barker, S (2002). *The feasibility of re-establishing the Pearl-bordered Fritillary Boloria euphrosyne in Feckenham Forest, east Worcestershire*. Unpublished report for Butterfly Conservation.

Fox, R., Asher, J., Brereton, T., Roy, D. and Warren, M. 2006. The State of Butterflies in Britain and Ireland. Pisces Publications.

Grundy, D., 2006. A List of Significant Species of Lepidoptera Recorded in the Wyre Forest. English Nature (unpublished report).

Harper, M. W. & Simpson, A. N. B. 2001. The Larger Moths and Butterflies of Herefordshire & Worcestershire. An Atlas. The West Midlands Branch of Butterfly Conservation.

Joy, J. 2002. Survey of the Wyre Forest for the Pearl-bordered Fritillary *(Boloria euphrosyne*) 2002. Unpublished report to English Nature, Forest Enterprise and Butterfly Conservation.

Joy, J. 2003a. Pearl-bordered Fritillary (*Boloria euphrosyne*) in the Wyre Forest 2003 Adult Monitoring Report. Contract Report Order No. WS49272 for English Nature, Hereford and Worcester Team. Butterfly Conservation Report No: SO3-24.

Joy, J. 2003b. Searches in the Wyre Forest for Pearl-bordered Fritillary (*Boloria euphrosyne*) Breeding Areas in Spring 2003. Unpublished report to English Nature.

Joy, J. 2003c. Report on the survey of Forest Enterprise Scallops for their suitability for Pearl-bordered Fritillary (*Boloria euphrosyne*). Butterfly Conservation Report SO3-25.

Joy, J. 2004. Pearl-bordered Fritillary (*Boloria euphrosyne*) in the Wyre Forest 2004 Adult Monitoring Report. Contract Report Order No. WS52529 for English Nature, Hereford and Worcester Team.

Joy, J. 2005. Pearl-bordered Fritillary (*Boloria euphrosyne*) in the Wyre Forest 2005 Adult Monitoring Report. Contract Report Order No. WS56317 for English Nature, Hereford and Worcester team. Butterfly Conservation Report No: SO5-41.

Joy, J. 2006. Pearl-bordered Fritillary (*Boloria euphrosyne*) Wyre Forest 2006 Monitoring Report. Report for Natural England and the Forestry Commission. Butterfly Conservation Report No: SO6-17.

Common Fan-foot
Pechipogo strigilata
Species Action Plan

1. Introduction
The common fan-foot is a UK BAP Species and is classed Nationally Notable A.

2. Current Status
2.1 Ecology and habitat requirements
The common fan-foot is associated with open woodland and recently abandoned coppice, usually on heavy soils. Important habitat features for this moth seem to include the presence of leaf litter, humid conditions, and cover from shrubs and the low branches of trees. Recent work on this moth in Worcestershire, Staffordshire and Shropshire (Grundy, 2002, 2004, 2005a,b, and 2006a) indicates that the larvae prefer feeding on brown withered *Quercus* spp. oak leaves hanging from trees.

2.2 Population and distribution
In Western Europe the range of the common fan-foot extends to the Caucasus, through Russia and Japan (Waring *et al.*, 1999). In Britain, it used to occur throughout much of England and parts of Wales and was recorded in 123 10km squares from 1961 to 1981. It has recently undergone significant declines in its range and is now known from only 12 sites nationally: a small number of woods in south-eastern and southern central England, Buckinghamshire and the West Midlands.

In Worcestershire the moth now appears largely confined to the Wyre Forest (Harper & Simpson, 2001) where it is still relatively widespread. 2006 was an exceptional year for the moth, with 93 adult moths and 45 larvae recorded in 16 areas within the Wyre Forest (Grundy 2006a).

2.3 Legislation
There is no legislation protecting the species in the UK.

2.4 Summary of important sites

The **Wyre Forest** is one of the largest ancient semi-natural woodlands in Britain extending to over 2,400 hectares. Approximately half of the forest is in Shropshire and half in Worcestershire. Large areas are managed by Forestry Commission England and Natural England with the remainder being privately owned. The Wyre Forest has one of the largest Lepidoptera species lists for any site in Britain with just short of 1,200 species recorded. This represents nearly half of the total number of species recorded in Britain (Grundy, 2006b). The Wyre Forest has been and continues to be a well-known national stronghold for a significant number of nationally and regionally important butterflies and moths such as *Boloria euphrosyne* pearl-bordered fritillary, *Boloria selene* small pearl-bordered fritillary, *Argynnis paphia* silver-washed fritillary, *Minoa murinata* drab looper, *Hypomecis roboraria* great oak beauty, *Angerona prunaria* orange moth and the dead wood specialist moths

Schiffermuellerina grandis and *Oecophora* bractella. The reason for this incredible diversity is the historical management of the forest and the subsequent mosaic of habitats present.

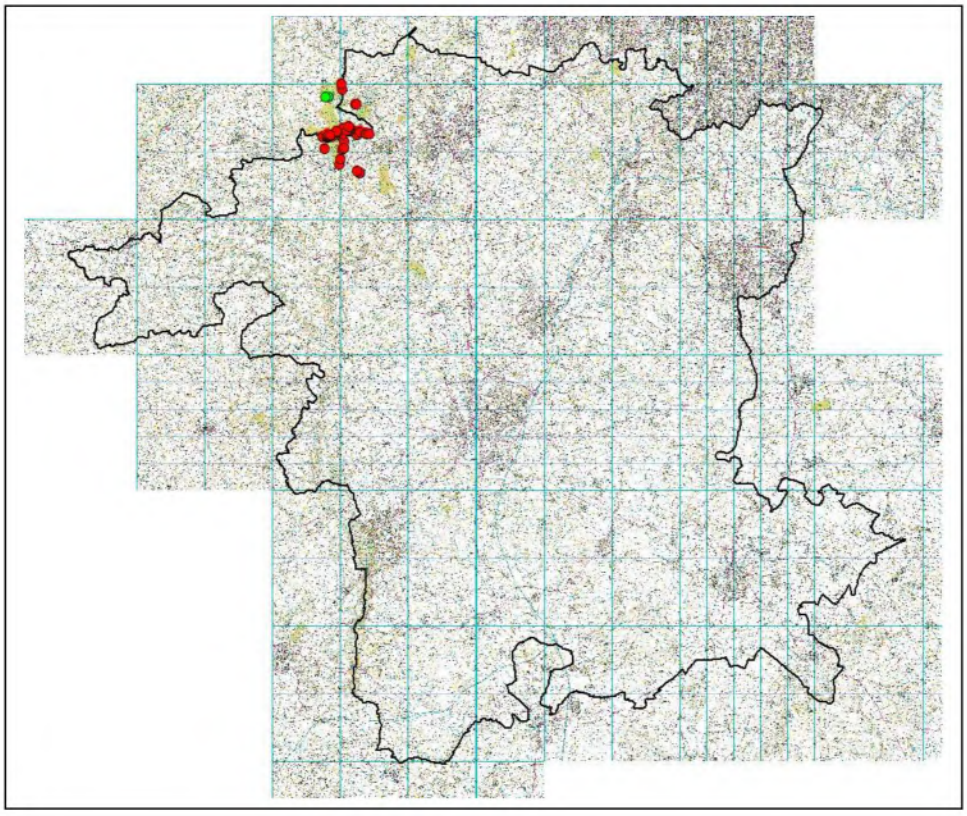

Figure 1. Records for common fan-foot in Worcestershire. Records 1990-1999 shown green, 2000 -2007 shown red. Data provided by Butterfly Conservation. *Note some data is displayed at hectad level.*

3. Current Factors Affecting the Species

- Climatic factors, especially warm wet winters, may result in poor larval survival although the effects are not fully understood.
- This moth appears to survive at low population densities therefore may only survive in the long term in big woodland complexes that support suitable habitat.
- The species is probably also affected by a lack of appropriate woodland management.

4. Current Action

4.1 Local protection

A large part (over 1700 hectares) of the Wyre Forest is a Site of Special Scientific Interest (SSSI) with the National Nature Reserve (NNR) covering over 500 hectares. Other parts of the forest have County Wildlife Site status and the Worcestershire Wildlife Trust has two nature reserves within the forest.

4.2 Site management and programmes of action

- A 'Limited Intervention Zone' has been created in the Park House area of the forest by Forestry Commission England with Natural England planning a similar zone in the Lodge Hill area. Continuing research into the ecological requirements of this moth in the Wyre Forest is still building a picture of its management needs. One recent recommendation is the felling of a small number of mature oak trees in prime common fan-foot habitat to aid the long-term survival of the species (Grundy, 2006a).

- Some regular woodland management (such as long term coppice rotation) is desirable. The aim is to provide good quantities of dead and dying leaves, particularly of oak, hanging from the tree during the adult flight period (for oviposition) then throughout the larval feeding period. Occasional felling of individual trees in leaf, which are then left in situ, may be beneficial to the species. Where the species is found, in the absence of further advice, management should aim to maintain continuity of the existing habitat structure (Wigglesworth *et al.).*

- In some parts of the Wyre Forest management recommendations for this moth may clash with the needs of other species e.g. pearl-bordered fritillary. Nevertheless, the large size of the forest enables a range of management options to be adopted in different areas so that the needs of particular species can be accommodated.

- In 2007, a SITA Trust funded Project 'Back to Orange' was started in the Wyre Forest. This project will enable conservation management work to be carried out in six areas of the forest over the next three years to improve the habitats for butterflies and moths including the common fan-foot.

4.3 Survey, research and monitoring

Common fan-foot have been monitored in the Wyre Forest since 2002. This has consisted of light trapping for adults (with traps set up at set intervals in specific areas of the forest) and the searching of pre-snapped branches for larvae along both a set transect route first established in 2003 and elsewhere in the forest.

Other parts of the Wyre Forest have been surveyed for the common fan-foot in the last five years and as a result of this the moth has now been recorded in 16 different areas (Grundy, 2004, 2005a, b, 2006a). The research carried out has already led to an increased understanding of the habitat needs of this species.

The 'Back to Orange' SITA Trust Project will allow survey, monitoring and research work to be focused on the common fan-foot at the Wyre Forest for the next three years.

5. Associated Plans

Scrub, Woodland.

6. Vision Statement

To continue with the research and monitoring programme for this moth to gain a better understanding of its habitat requirements.

To ensure land managers in the Wyre Forest area continue to be aware of the presence of this moth.

To ensure appropriate management is undertaken so that the population can be conserved and enhanced.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Population	Enhance the size of the common fan-foot population in the Wyre Forest (or increase the number of occupied 1km squares).	50 adults in prime areas	100 adults in prime areas.	2012
Population	Encourage the common fan-foot population to continue to increase above the 2012 level and to colonise at least one new site.	100 adults in prime areas.	150 adults in prime areas.	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead organisation	Support organisation
WRC CFF CA 01	**2.12**	Engage with landowners of identified sites and provide advice on appropriate management.	Wyre Forest area	2017	BC	
WRC CFF CP 01	**3.11**	Maintain liaison with key land managers to provide updates on the status of common fan-foot populations and research results that can inform site management.	Wyre Forest	2017	BC	NE FCE WWT
WRC CFF CP 02	**3.5**	Produce one press release on the current status of the common fan-foot moth in the Wyre Forest.	Wyre Forest	2012	BC	NE FCE
WRC CFF HS 01	**6.15**	Identify sites where targeted woodland management could encourage colonisation by the moth or where (re-) introduction could be appropriate.	Wyre Forest area	2010	BC	NE FC WWT
WRC CFF SU 01	**13.4**	Continue annual research and monitoring programme for the common fan-foot by light trapping and larval transects.	Wyre Forest	2012	BC	NE FCE WFSG

NE – Natural England **BC** – Butterfly Conservation **FCE** – Forestry Commission England
WWT – Worcestershire Wildlife Trust **WFSG** – Wyre Forest Study Group

References and further information

Grundy, D.A. (2002). *A Pilot Study of the Common Fan-foot Moth (*Pechipogo strigilata*) in the Wyre Forest – 2002.* Report for English Nature, Forestry Commission, Worcestershire County Council, and Butterfly Conservation (West Midlands Branch) (unpublished report).

Grundy, D. (2004). *A Study of the Common Fan-foot Moth* Pechipogo strigilata *in the Wyre Forest and Other Sites – 2003.* Report for English Nature, Forestry Commission and Butterfly Conservation (West Midlands Branch) (unpublished report).

Grundy, D. (2005a). *A Brief Study of the Common Fan-foot Moth* Pechipogo strigilata *in the Wyre Forest and Churnet Valley – 2004.* Report for Forestry Commission and Butterfly Conservation (West Midlands Branch) (unpublished report).

Grundy, D. (2005b). *A Study of the Common Fan-foot Moth* Pechipogo strigilata *in the Wyre Forest and Churnet Valley – 2005.* Report for English Nature, Forestry Commission and Butterfly Conservation (West Midlands Branch) (unpublished report).

Grundy, D. (2006a). *A Study of the Common Fan-foot Moth* Pechipogo strigilata *in the Wyre Forest – 2006*. Report for Natural England and the Forestry Commission (unpublished report).

Grundy, D. (2006b). *A List of Significant Species of Lepidoptera Recorded in the Wyre Forest.* English Nature (unpublished report).

Harper, M. W. & Simpson, A. N. B. (2001). *The Larger Moths and Butterflies of Herefordshire & Worcestershire. An Atlas.* The West Midlands Branch of Butterfly Conservation.

Waring, P., Bourn, N., Spalding, A., & Phillips, D. (1999). *UK Biodiversity Action Plans Priority Moth Species Species Accounts and Species Action Plans*. Butterfly Conservation (unpublished report).

Wigglesworth, T., Parsons, M. & Warren, M. *Common Fan-foot* Pechipogo strigilata *Factsheet*. Butterfly Conservation, Wareham.

Drab Looper
Minoa murinata
Species Action Plan

1. Introduction
The drab looper is a priority UK BAP species and is classed Nationally Notable B.

2. Current Status
2.1 Ecology and habitat requirements
The drab looper is most frequent in ancient woodland in open, sheltered, sunny situations and along ride edges where its larval foodplant *Euphorbia amygdaloides* wood spurge is abundant and present in large stands. The moth can also be found in other non-ancient woods with coppice plots or areas of clear-fell but here regular active management will be needed to retain the species in the long term (especially in woods where wood spurge has only a scattered distribution).

2.2 Population and distribution
Drab looper is recorded in central and southern Europe (Waring *et al*, 1999). The moth has a restricted distribution in Britain with two main centres of population still remaining. These are a) central southern England (e.g. Dorset, Hampshire, Wiltshire and Berkshire) and b) the borders of England and Wales from Gloucestershire and Monmouthshire to Herefordshire and Worcestershire, with some colonies also found in Kent. The species used to be more widespread and recorded in a number of other English counties such as Bedfordshire and Essex.

Butterfly Conservation has recent records for this moth from a number of counties in the West Midlands region including Herefordshire (Ledbury, Great Doward, and Haugh Wood), Shropshire (Wyre Forest) and Worcestershire (Wyre Forest and Monkwood). In Worcestershire the drab looper has been described as a local fairly common resident in open woodland containing wood spurge (Harper & Simpson, 2002) whereas Grundy (2006a) has recently described it as rare in the Wyre Forest.

2.3 Legislation
There is no legislation protecting the species in the UK.

2.4 Summary of important sites
The **Wyre Forest** is one of the largest ancient semi-natural woodlands in Britain extending to over 2,400 hectares. Approximately half of the forest is in Shropshire and half in Worcestershire. Large areas are managed by Forestry Commission England and Natural England with the remainder being privately owned. The Wyre Forest has one of the largest Lepidoptera species lists for any site in Britain with just short of 1,200 species recorded. This represents nearly half of the total number of species recorded in Britain (Grundy, 2006b). The Wyre Forest has been and continues to be a well-known national stronghold for a significant number of nationally and regionally important butterflies and moths such as *Boloria euphrosyne* pearl-bordered fritillary, *Boloria selene* small pearl-bordered fritillary, *Argynnis paphia*

silver-washed fritillary, *Pechipogo strigilata* common fan-foot, *Hypomecis roboraria* great oak beauty, *Angerona prunaria* orange moth and the dead wood specialist moths *Schiffermuellerina grandis* and *Oecophora bractella.* The reason for this incredible diversity is the historical management of the forest and the subsequent mosaic of habitats present.

Monkwood is jointly owned and managed by Butterfly Conservation and Worcestershire Wildlife Trust. Part of the wood is managed as coppice with standards with much of the ride edge management work carried out in the past being done by volunteers. It contains a number of nationally and regionally important butterflies and moths such as *Leptidea sinapis* wood white, *Satyrium w-album* white-letter hairstreak, *Egira conspicillaris* silver cloud and *Eupithecia plumbeolata* lead-coloured pug.

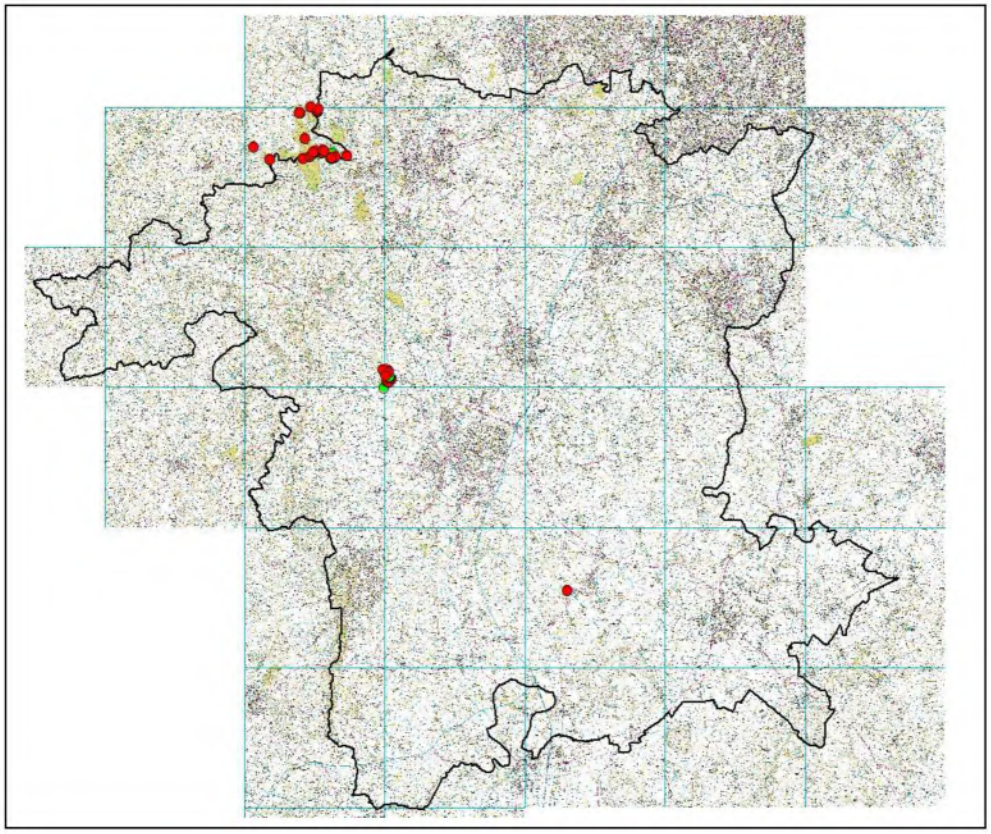

Figure 1. Records for drab looper in Worcestershire. Records 1990-1999 shown green, 2000-2007 shown red. Data provided by Butterfly Conservation. *Note some data is displayed at hectad level.*

3. Current Factors Affecting the Species

- Cessation of woodland coppice management.
- Replacement of small-scale rotational felling by management of large-scale plantations of even-aged tree crops, particularly conifers.
- Shading of ride edges.

4. Current Action

4.1 Local protection

A large part (over 1700 hectares) of the Wyre Forest is a Site of Special Scientific Interest. Monkwood is also an SSSI and a joint Butterfly Conservation / Worcestershire Wildlife Trust nature reserve.

4.2 Site management and programmes of action

- The main aim of management should be to encourage a plentiful and continual supply of wood spurge in sunny but sheltered conditions. This can be achieved by creating and managing areas of linked coppice or clear-fell with rotational clearance of ride margins, scalloping of ride edges and the creation of box junctions (Parsons & Thomas).

- At Monkwood it is likely that the drab looper benefited from the ride-side management regime set up to improve the habitat for the wood white butterfly in the early 1990s.

- In the Wyre Forest area management recommendations to improve the habitat for drab looper have been put forward (Grundy, 2006b, 2007). Some experimental management and monitoring trials have now taken place around existing wood spurge blocks and some wood spurge propagation trials have also been proposed (Grundy, 2007).

- In 2007, a SITA Trust funded Project 'Back to Orange' was started in the Wyre Forest. This project will enable conservation management work to be carried out in six areas of the forest over the next three years to improve the habitats for butterflies and moths including the drab looper.

4.3 Survey, research and monitoring

- Targeted surveys of the Wyre Forest for drab looper adults were carried out in 2003, 2004 and 2006 with 7, 6 and 9 being seen respectively (Grundy, 2003, 2005, 2006b, 2007).

- A survey for this species was carried out at Monkwood (Gregory, 2004) to establish a baseline for future monitoring of this species via a transect. The maximum number recorded here in 2004 was 13.

- A targeted survey of the Malvern Hills area in 2007 led to the discovery of at least 3 colonies (with these colony areas straddling the Worcestershire-Herefordshire county boundary).

- The 'Back to Orange' SITA Trust Project will allow survey, monitoring and research work to be focused on the drab looper in the Wyre Forest for the next three years.

5. Associated Plans

Scrub, Woodland.

6. Vision Statement

To continue and expand the research and monitoring programme for this moth in Worcestershire (including trial management work on wood spurge) to gain a better understanding of its distribution and habitat requirements.

To ensure land managers in Worcestershire continue to be aware of the presence of this moth.

To ensure appropriate management is undertaken so that populations can be conserved and enhanced.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Population	Increase the size of the drab looper population in the Wyre Forest	Nine adults on six sites	Thirty adults on six sites	2012
Population	Increase the size of the drab looper population at Monkwood	Peak count of 13 adults on transect	Peak count of 30 adults on transect	2012
Range	Increase the range of the drab looper through the recolonisation of at least one former site	Four occupied sites	Five occupied sites	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead organisation	Support organisations
WRC DRL CA 01	**2.11**	Engage with landowners of identified sites and provide advice on appropriate management.	Worcestershire	2017	BC	
WRC DRL CP 01	**3.11**	Maintain annual liaison with key landowners and managers to provide updates on the status of the drab looper populations and any autecological research results.	Monkwood, Wyre Forest, Malvern Hills and other Worcestershire sites	2017	BC	NE FCE WWT MHC AONB Partnership
WRC DRL CP 02	**3.5**	Produce one press release on the current status of the drab looper moth in the region.	Worcestershire	2012	BC	NE FCE
WRC DRL HS 01	**6.15**	Identify sites with historical records where targeted woodland management could encourage colonisation by the moth or where (re-) introduction could be appropriate.	Worcestershire	2012	BC	NE FCE WWT
WRC DRL ID 01	**8.5**	Survey of all historical drab looper sites to establish current status and determine baseline	Worcestershire	2012	BC	WWT FCE

		population.				
WRC DRL SU 01	**13.4**	Continue annual research and monitoring programme for the drab looper and wood spurge and increase survey coverage to include at least two other sites.	Monkwood, Wyre Forest and Malvern Hills	2017	BC	NE FCE MHC WWT

BC – Butterfly Conservation **FCE** – Forestry Commission England **NE** – Natural England
WWT – Worcestershire Wildlife Trust **MHC** – Malvern Hills Conservators
AONB Partnership – Area of Outstanding Natural Beauty (Malvern Hills) Partnership

References and further information

Gregory, N (2004). *Drab Looper survey at Monkwood 2004*. Butterfly Conservation Unpublished Report.

Grundy, D (2003). *A Brief Study of the Drab Looper Minoa murinata and Argent and Sable* Rheumaptera hastata *Moths in the Wyre Forest, Shropshire and Worcestershire – 2003.* Unpublished Forestry Commission report.

Grundy, D (2005). *A Pilot Study of the Drab Looper Moth Minoa murinata in the Wyre Forest, Shropshire and Worcestershire – 2004. (With Brief Notes on the Argent and Sable* Rheumaptera hastata*).* Unpublished English Nature and Forestry Commission report.

Grundy, D (2006a). *A List of Significant Species of Lepidoptera Recorded in the Wyre Forest.* Unpublished *r*eport for English Nature.

Grundy, D. (2006b). *A Brief Study of the Drab Looper Moth Minoa murinata in the Wyre Forest, Shropshire and Worcestershire – 2005.* Unpublished English Nature report.

Grundy, D. (2007). *A Brief Study of the Drab Looper Moth Minoa murinata in the Wyre Forest – 2006*. Unpublished report for Natural England.

Harper, M. W. & Simpson, A. N. B (2001). *The Larger Moths and Butterflies of Herefordshire & Worcestershire. An Atlas.* The West Midlands Branch of Butterfly Conservation.

Parsons, M. & Thomas, K. *Drab Looper Minoa murinata factsheet*. Butterfly Conservation, Wareham.

Waring, P., Bourn, N., Spalding, A., & Phillips, D (1999). *UK Biodiversity Action Plans Priority Moth Species Species Accounts and Species Action Plans.* Butterfly Conservation (unpublished report).

Adder
Vipera berus
Species Action Plan

1. Introduction
The adder is Europe's most widespread snake species but one of only three that occurs naturally in the UK. Whilst widespread and locally common in some areas its distribution is scattered and declining in Worcestershire. It is a priority UK BAP species.

2. Current Status
2.1 Ecology and habitat requirements
Adders are able to utilise a diverse range of habitats, varying from lowland meadows, hillsides, moorland, marshland, woodland, scrub and heath. They show a marked preference for sites with a southerly aspect. Adders hibernate through the winter and emerge in late winter / early spring where they can frequently be seen basking near the hibernacula. Prior to mating the males wrestle for dominance, often referred to as a "combat dance". After mating adders disperse to their summer feeding areas, except for pregnant females who do not feed. These feeding areas can be as much as 1km away from the hibernacula. Their diet consists of small mammals (mainly voles) and lizards. In the autumn they return to the hibernation area where the females give birth to live young before retiring for the winter period.

2.2 Population and distribution
Adders once existed where suitable habitat was present across most of mainland Britain. However there is now overwhelming evidence that the species is in rapid decline in many areas and this is currently the situation within Worcestershire. Adders are now primarily confined to heathland, meadow and woodland in the west and north west of the county, the main sites being the Wyre Forest, Habberley Valley, Kingsford Forest Park and the Malvern Hills. Figure 1 shows adder records held for Worcestershire. The map clearly demonstrates that current records (2000 onwards) are confined to these areas mentioned above. There are scattered records from elsewhere in the county: many of these are classed as historical data, although there have been odd occasions in recent years when isolated individuals have been found on these 'historical' sites. Whether this is the result of the migration of adders from elsewhere, or whether the species is simply very under-recorded is unclear. We must never overlook the possibility of more of these 'historical' sites, or indeed new sites, being found to support adders today.

Overall, the Midlands is an area of particular concern as both adder and *Anguis fragilis* slow-worm are thought to be in greater decline here than elsewhere in the country. Individual reports reiterate the concern over adder population status in the Midlands. Monitoring in the Wyre Forest (Worcestershire and Shropshire) has detected decreases in the number of sites occupied by adders and in the mean number of sightings per site (Sheldon - Wyre Forest Study Group review).

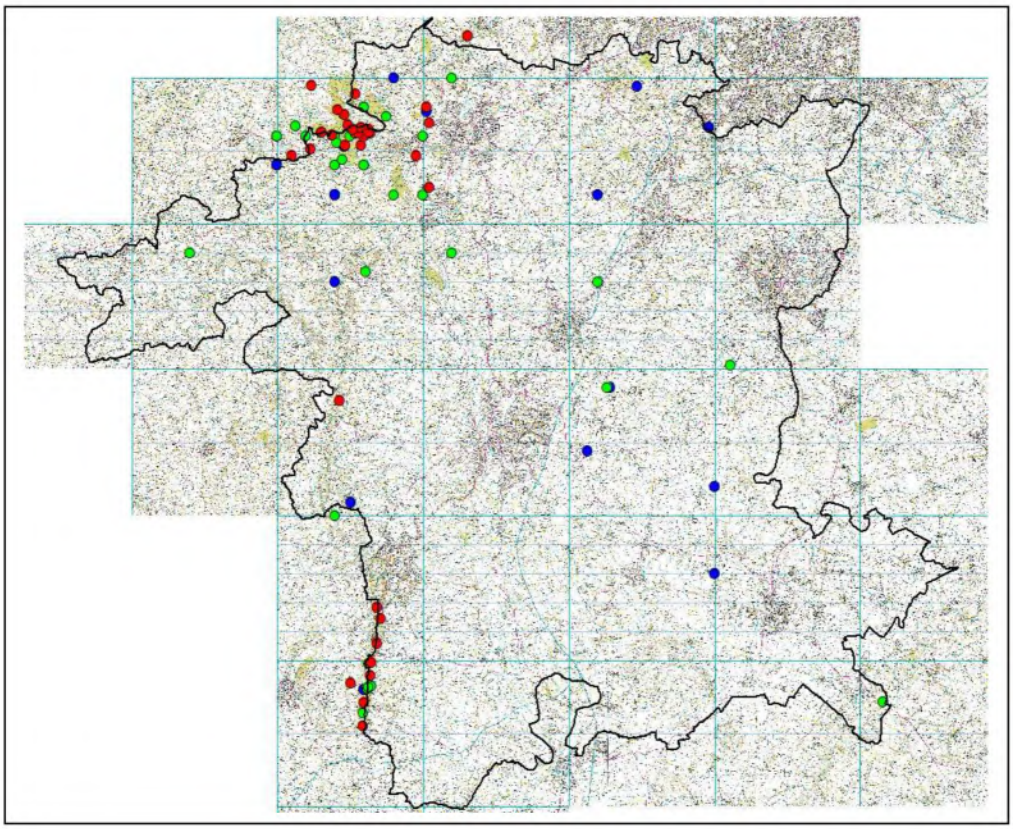

Figure1. Records for adder in Worcestershire to 2007. Records pre-1979 are shown blue, 1980-1999 shown green and 2000-2007 shown red. Data provided by Worcestershire Biological Records Centre. *Note some data is displayed at hectad and tetrad level.*

2.3 Legislation

The adder is protected under schedule 5 of the Wildlife and Countryside Act 1981.

2.4 Summary of important sites

Wyre Forest lies to the north of the county. It comprises 2,500 ha of mixed woodland with small meadows, wide sunny rides, scrub and heathland within its boundaries. Half of the forest is in Shropshire with much of the south facing land to the north of the forest. The main landowners / managers are Forestry Commission England and Natural England, who together manage around 45% of the forest, with the remaining land being owned privately.

Habberley Valley is a 37 ha acid grassland and lowland heathland complex. It is owned and managed by Wyre Forest District Council.

Kingsford Forest Park is managed by Worcestershire County Council Countryside Service and lies on the edge of a red sandstone ridge with 200 acres of pine forest, broadleaved woodland and pockets of open heathland.

The **Malvern Hills** are one of the largest areas of semi-natural vegetation in the West Midlands supporting a mosaic of habitat types, including acid grassland, scrub, woodland and some small areas of heathland.

3. Current factors affecting the species

- Sites throughout the county containing potentially suitable habitat have increasingly become fragmented and isolated by development and road building making the migration of remaining individuals difficult.

- Despite their legal protection adders are still subject to persecution from humans, particularly as increasing development brings them into closer contact with people as populations are squeezed into smaller and diminishing numbers of sites.

- Agricultural practices have changed and increased stocking densities have altered the nature of the tussock rich grassland that adders favour as habitat.

- The utilisation of heavy machinery in land management operations can directly impact on the burrows used by the adder by causing ground compaction on hibernaculums, preventing them from emerging in the spring. The vibrations from these machines may also cause undue stress to adders during this critical time.

- Increased visitor and recreation pressure on key sites impacts on adder populations through disturbance and habitat degradation. For example, the Wyre Forest suffers in some areas because of the use of mountain bikes. There have also been instances of adders being injured or killed by dogs.

- Increasing populations of predators, such as *Buteo buteo* buzzard and *Phasianus colchicus* pheasant, has also had an impact on local populations of adders.

- The widespread clearance of trees and scrub where the presence of the adder has not been given appropriate consideration can have a detrimental impact on the species, as they are slow to adapt to sudden landscape-scale habitat changes within their environment.

4. Current Action

4.1 Local protection

There are no sites in Worcestershire that are protected specifically for their adder populations, although many of the key sites where adders are found have designations for other reasons:

- 1753 ha of the Wyre Forest is designated a SSSI, and 549 ha a NNR.
- 732 ha of the Malvern Hills is designated a SSSI and the main hills and commons constitute around 11% of the Malvern Hills AONB.
- Habberley Valley is owned and managed by Wyre Forest District Council as a Local Nature Reserve.
- Kingsford Forest Park is managed by Worcestershire County Council as a Local Nature Reserve.

4.2 Site management and programs of action

Work is being carried out in the Wyre Forest on an ongoing basis to monitor the extent and locations of the adder populations. The annual report produced by Sylvia Sheldon helps to inform the management work carried out by Forestry Commission England, Natural England, Worcestershire County Council, Wyre Forest District Council, Worcestershire Wildlife Trust and private landowners to ensure that adder sites are appropriately maintained and protected.

The primary hibernacula site in Habberley Valley has been fenced to deter public access.

Large-scale clearance of secondary woodland has taken place on the southeasterly slopes of Habberley Valley. This work was done without using machinery on the banks, the timber being removed either by heavy horse or through zip lines. Some cord wood was retained and a few large stumps were partially uprooted to act as possible adder refuges.

On the Malvern Hills and Commons scrub management is being targeted around adder hibernacula and feeding sites to provide habitat for prey species. Nigel Hand has been instrumental in plotting the migration routes from hibernacula to the feeding grounds whilst also monitoring individuals on the various sites. Through the results of the survey work the timing and intensity of grazing has been adjusted to make sure the adders are not disturbed at key times. The management work is carried out by the Malvern Hills Conservators on the advice of Nigel Hand.

4.3 Survey, research and monitoring

Sylvia Sheldon and Chris Bradley have carried out an extensive annual population inventory of adders in the Wyre Forest area since 1982 and they have also recorded in other areas of Worcestershire. These studies have raised the awareness of local landowners and management has improved in recent years. A report is produced annually and advice given on appropriate management.

Wyre Forest District Council has carried out ad-hoc surveys for adder on their sites for a number of years. Most recently, a survey was commissioned in Spring 2007 to look at whether any remnant populations exist on District Council-owned heathland areas around Kidderminster and what the suitability of this habitat is for adder. The fieldwork for this survey has taken place and a report is currently being written.

Public liaison has been carried out with press articles and a public meeting to raise awareness of the conservation significance of the species and challenge negative attitudes towards the adder. Requests have been made through local media for people to report adder sightings. This has lead to the identification of a possible unknown site for adder at Redstone Marsh in Stourport.

Nigel Hand has been recording the reptiles on the Malvern Hills and Commons for the last 5-10 years and has estimated that the site may contain the largest population of adders in the county. In 2007 the Malvern Hills Conservators and the Malvern Hills AONB funded a survey of all of the Hills and Commons to pinpoint hibernacula and also find new areas where adders where present: the new areas will be searched for hibernacula by Nigel in 2008. A report on the status of the adder on the Malvern Hills and Commons is due by the end of June 2007.

5. Associated plans

Lowland Heathland, Woodland, Wood Pasture and Veteran Trees, Wet Grassland, Hedgerows, Scrub, Traditional Orchards, Acid Grassland, Neutral Grassland, Biological Recording, Education and Awareness.

6. Vision Statement

Maintain habitat quality on sites known to hold adder populations.

Improve our knowledge of adder population distribution within Worcestershire by encouraging and training volunteers / land managers to take part in monitoring schemes.

Advice and guidance on adder ecology and protecting and maintaining adder populations in Worcestershire to be available to all land managers and professionals who may encounter the species in carrying out their jobs.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Population	Train new volunteers to actively carry out survey work	0	6	2010

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC ADD AP 01	**1.1**	Establish an adder task group (ATG), as a working group of WRAG, to steer all work in the county that relates to this species. Group to meet at least annually.	Worcestershire	2008	WFDC	NE, WRAG, WWT, WCC, FCE
WRC ADD CA 01	**2.15**	Provide training in adder identification and survey techniques to volunteer officers.	Habberley Valley	2009	WFDC	FCE
WRC ADD CA 02	**2.11**	Adder guide to be available on the WBP website.	Worcestershire	2009	WCC	NE, WWT, WCC, WFDC
WRC ADD CP 01	**3.5**	Create five opportunities to use local media to promote adder conservation and habitat requirements to local communities	Habberley Valley	2017	WFDC	
WRC ADD CP 02	**3.5**	Create five opportunities to use local media to promote adder conservation and habitat requirements to local communities	Malvern Hills	2017	MHC	
WRC ADD CP 03	**3.5**	Create five opportunities to use local media to promote adder conservation and habitat requirements to local communities	Kingsford Country Park	2017	WCC	
WRC ADD CP 04	**3.5**	Create five opportunities to use local media to promote adder conservation and habitat requirements to local communities	Wyre Forest	2017	FCE	
WRC ADD CP 05	**3.7**	Adder to be included on interpretation panels placed at entrances to site.	Habberley Valley	2009	WFDC	WWT
WRC ADD CP 06	**3.19**	A page dedicated to the ATG to be developed and hosted on the Worcestershire Biodiversity Partnership website.	Worcestershire	2008	WCC	
WRC ADD FR 01	**4.13**	Establish a team of volunteer adder / reptile officers from local communities.	Habberley Valley	2009	WFDC	WWT

WRC ADD FR 02	**4.13**	Expand volunteer base through local publicity to carry out sensitive habitat management.	Habberley Valley	2010	WFDC	
WRC ADD FR 03	**4.13**	Recruit key volunteers to assist with surveying and recording on historical sites in Worcestershire.	Worcestershire	2008	FCE	NE, WWT, WCC, WFDC
WRC ADD HC 01	**7.2**	Where possible carry out habitat creation / restoration on these identified sites (WRC ADD HS 06) to extend the species range and reverse habitat fragmentation.	Wyre Forest District	2012	WFDC	NE, FCE, WWT
WRC ADD HS 01	**6.11**	Identify conflicts between site users, site management and adders and implement appropriate action to reduce potential risk to adders and their habitat.	Habberley Valley	2010	WFDC	
WRC ADD HS 02	**6.11**	Identify conflicts between site users, site management and adders and implement appropriate action to reduce potential risk to adders and their habitat.	Kingsford Country Park	2010	WCC	NE
WRC ADD HS 03	**6.11**	Identify conflicts between site users, site management and adders and implement appropriate action to reduce potential risk to adders and their habitat.	Malvern Hills	2010	MHC	
WRC ADD HS 04	**6.11**	Identify conflicts between site users, site management and adders and implement appropriate action to reduce potential risk to adders and their habitat.	Wyre Forest	2010	FCE	
WRC ADD HS 05	**6.11**	Identify conflicts between site users, site management and adders and implement appropriate action to reduce potential risk to adders and their habitat.	Knowles Meadow	2010	WWT	FCE
WRC ADD HS 06	**6.15**	Identify areas having the potential to link isolated Adder populations or buffer existing adder habitat.	Wyre Forest District	2008	WFDC	NE, FCE, WWT
WRC ADD SM 01	**12.3**	Produce proposal document for a breeding and reintroduction project onto suitable sites in the county	Worcestershire	2008	WFDC	
WRC ADD SM 02	**12.3**	Meeting and site visit with Natural England to discuss reintroduction proposal.	Worcestershire	2008	WFDC	FCE, WWT

WRC ADD SU 01	**13.4**	Support volunteer officers to carry out annual adder surveys of their adopted site.	Habberley Valley	2017	WFDC	WWT
WRC ADD SU 02	**13.4**	Continue to monitor adder populations annually and use surveys/research to inform the sympathetic and sensitive management of sites.	Habberley Valley	2017	WFDC	
WRC ADD SU 03	**13.4**	Continue to monitor adder populations and use surveys/research to inform the sympathetic and sensitive management of sites.	Wyre Forest	2017	FCE	NE
WRC ADD SU 04	**13.4**	Continue to monitor adder populations and use surveys/research to inform the sympathetic and sensitive management of sites.	Kingsford Country Park	2017	WCC	
WRC ADD SU 05	**13.4**	Continue to monitor adder populations and use surveys/research to inform the sympathetic and sensitive management of sites.	Malvern Hills	2017	MHC	
WRC ADD SU 06	**13.2**	Examination of historical adder records to determine and prioritise likely sites for re-surveying.	Worcestershire	2008	FCE	NE, WWT, WCC, WFDC
WRC ADD SU 07	**13.2**	Re-survey prioritised historical sites. Survey suitable habitat up to 1/2km from each site.	Worcestershire	2010	FCE	NE, WWT, WCC, WFDC

WRAG - Worcestershire Reptile and Amphibian Group
MHDC – Malvern Hills District Council
FCE - Forestry Commission England
WFDC - Wyre Forest District Council
BDC – Bromsgrove District Council
WCC - Worcestershire County Council
WWT - Worcestershire Wildlife Trust
MHC – Malvern Hills Conservators
WCC – Worcestershire County Council
RBC – Redditch Borough Council
WorcsCC – Worcester City Council
WDC – Wychavon District Council

References and further information

Baker, J., Suckling, J and Carey, R (2004). *Status of the adder Vipera berus and slow-worm Anguis fragilis in England.* English Nature Research Report 546. http://www.english-nature.org.uk/pubs/publication/PDF/546.pdf

Habberley Valley LNR Adder Survey, Wyre Forest District Council, Countryside Consultants Ltd 2006.

Sheldon, S., Bradley, C and Garbett, A (2006). *Wyre Forest Adder Census Report 2006.* (Reports from other years also available).

Slow-worm
Anguis fragilis
Species Action Plan

1. Introduction
The slow-worm is a priority UK BAP species.

2. Current Status
2.1 Ecology and habitat requirements
Despite its snake-like appearance, the slow-worm is a legless lizard. In common with other species of lizard, they are distinguishable from snakes by the visible eyelids and the ability to shed their tail: a defence response to help escape from predators by providing a distraction.

Female slow-worms tend to have dark flanks and a thin, dark stripe down the back. They also have relatively smaller heads than males. Males tend to be a uniform grey colour, lacking the longitudinal stripe and often have a scattering of blue spots. Older slow-worms tend to have a duller appearance and are often battle scarred. In spring the males often fight, presumably to see off potential rivals for mates. Mating itself can also be quite aggressive, with males holding females tightly in their jaws. Despite these conflicts slow-worms are harmless to humans, and do not bite. Slow-worms are long-lived: 20 years or more in the wild, and over 50 years has been recorded in captivity.

A brood of live young is produced in September or October. Each baby is born in a transparent membrane, from which it emerges almost immediately. Newly hatched slow-worms are like miniature versions of adult females, with dark sides and a stripe along the back, contrasting with a striking yellow, gold or copper background. Adult slow-worms can grow up to 45 cm in total length, whereas the newly-born young are 7 to 10 cm long.

The slow-worm can be found in almost any open or semi-open habitat. It likes warmth but instead of basking in the open sun it prefers to hide under a stone, log or piece of discarded rubbish such as a sheet of corrugated iron or plank of wood exposed to the sun. Slow-worms are also keen on compost heaps where they find warmth and plenty of food. They feed on slow moving prey, particularly slugs. Slow-worms hibernate throughout the winter months, sometimes sharing hibernation sites with other animals.

2.2 Population and distribution
The slow-worm is probably the most commonly encountered British reptile. It is naturally absent from Ireland (those found there, in the area of the Burren, are thought to be introduced). It occurs throughout most of Europe, including virtually all of Great Britain, although it tends to be most abundant in the southern counties. However, slow-worms are very patchily distributed and tend to be aggregated into small pockets on a given site. Allotments provide ideal conditions for slow-worms and surveys in several counties have shown a high correlation between allotments and reptile, particularly slow-worm, presence.

In Worcestershire the species is widely distributed although due to its secretive nature it is often under-recorded. There is also a tendency for the species to be misidentified as a snake.

The slow-worm shows a tendency to occur in urban habitats such as allotments and railway sidings. The general national decline of the species in recent years makes these habitats all the more important.

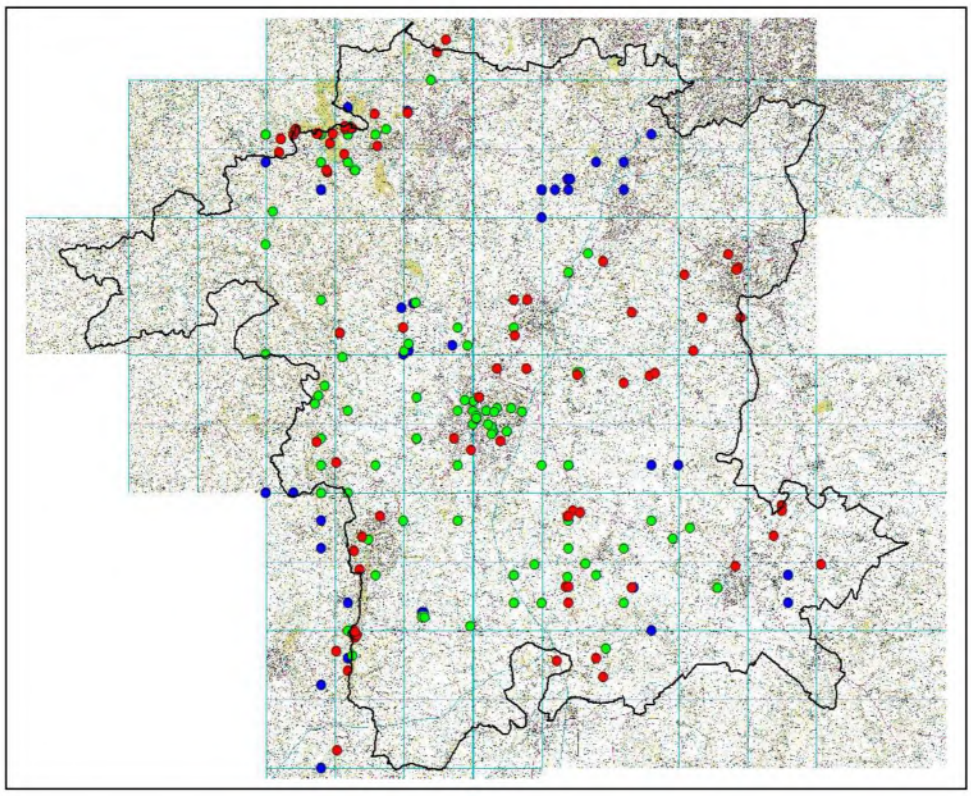

Figure 1. Slow-worm records in Worcestershire to 2007. Records pre-1979 are shown blue, 1980-1999 shown green and 2000-2007 shown red. Data provided by Worcestershire Biological Records Centre. *Note some data is displayed at hectad and tetrad level.*

2.3 Legislation

The slow-worm is protected under schedule 5 of the Wildlife and Countryside Act.

2.4 Summary of important sites

Worcester city is now considered to be nationally important for this reptile and the Lansdowne Crescent allotments are probably the best urban site for slow-worms in England. Most rural records tend to come from nature reserves.

3. Current factors affecting the species

- Loss of habitat due to intensive agricultural land use and increased use of pesticides causing a shortage of prey items.
- Deliberate attacks by humans who mistakenly believe them to be dangerous.
- Accidental killing due to their frequency of occurrence in allotments and gardens.
- Slow-worms are quick to exploit brown-field sites that are now increasingly favoured for development. This has led in recent years to populations being translocated to ever smaller and more fragmented sites as part of

the development mitigation, a situation that is not sustainable and is leading inevitably to the further decline of the species in Worcestershire.

- The unsympathetically timed management of fields, roadside verges and other sites using mechanical equipment can have severe impacts on slow-worm populations, particularly if pregnant females are killed.

4. Current Action

4.1 Local protection

Worcester City Council has designated the Lansdowne allotments as a slow-worm sanctuary.

4.2 Site management and programmes of action

Worcester City Council provided purpose-built hibernacula on Lansdowne allotments in 1998. Many of the allotment tenants are now managing their plots sympathetically.

Advice on slow-worm conservation can be obtained from Worcestershire Wildlife Trust, Froglife, the British Herpetological Society, Herpetological Conservation Trust, Worcestershire Reptile and Amphibian Group and Natural England.

4.3 Survey, research and monitoring

The **National Amphibian and Reptile Recording Scheme** (NARRS) is a national wildlife-monitoring project to measure trends in the conservation status of all UK species of amphibian and reptile. NARRS is being led by The Herpetological Conservation Trust in partnership with other organisations. It will provide information on the status of amphibians and reptiles in Britain, but will also raise awareness and appreciation of these species and encourage people to get involved in recording and conservation. NARRS will coordinate and combine data from a number of surveys including the Slow-worm Compost Survey that encourages gardeners and allotment holders to record sightings.

A survey of the slow-worm populations within Worcester city was undertaken in 1997 by Worcestershire Wildlife Consultancy on behalf of Worcester City Council's Project Greenspace. Refugia were positioned at 27 sites and re-visited to gather highest count data. A repeat of this survey is planned if the funding can be secured.

5. Associated Plans

Traditional Orchards, Scrub, Urban, Semi-natural Grassland.

6. Vision Statement

That Worcester City continues to be a nationally important stronghold for slow-worm with all known and potential habitat within the city protected and enhanced whenever the opportunity allows. The importance of both urbanised and rural areas of slow-worm habitat throughout the county will be recognised, valued and protected by all Worcestershire residents.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Population	Re-survey 27 key sites within Worcester City to determine changes in slow-worm populations	0 sites	27 sites	2015

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC SLW CP 01	**3.15**	In partnership with allotment owning organisations and groups, develop an information and awareness campaign to raise the profile of the slow-worm and its ecology and to encourage allotment workers to record and report sightings.	Worcestershire	2010	WCC	WWT, WWC, WDC, MHDC, WorcsCC, WFDC, BDC, RBC
WRC SLW FR 01	**4.11**	Secure funding and repeat the slow-worm survey of Worcester City allotment sites.	Worcester City	2015	WorcsCC	WCC

WCC – Worcestershire County Council
WDC – Wychavon District Council
WFDC – Wyre Forest District Council
WWT – Worcestershire Wildlife Trust
MHDC – Malvern Hills District Council
BDC – Bromsgrove District Council
WWC – Worcestershire Wildlife Consultancy
WorcsCC – Worcester City Council
RBC – Redditch Borough Council

References and further information

Shepherd, A.G (1997). *Urban slow-worms in Worcester City.* Worcestershire Record Issue 3.

Shepherd, A.G (1997). *Slow-worm Survey of Worcester City 1997 (Report to Worcester City Council)*. Worcestershire Wildlife Consultancy.

www.narrs.org.uk

www.herpconstrust.org.uk

Great Crested Newt
Triturus cristatus
Species Action Plan

1. Introduction
The great crested newt is a priority UK BAP species.

2. Current Status
2.1 Ecology and habitat requirements
The great crested newt is the largest native British newt, reaching up to 17 cm in length. It has a granular skin texture (caused by glands which contain toxins making it unpalatable to predators), and in the terrestrial phase is dark grey, brown or black over most of the body, with a bright yellow/orange and black belly pattern. Adult males have jagged crests running along the body and tail. Newts require aquatic habitats for breeding. Eggs are laid singly on pond vegetation in spring and larvae develop over summer to emerge in August – October, normally taking 2–4 years to reach maturity. Juveniles spend most of their time on land, and all terrestrial phases may range a considerable distance from breeding sites.

Breeding sites are mainly medium-sized ponds, though ditches and other waterbody types may also be used less frequently. Ponds with ample aquatic vegetation (which is used for egg-laying) seem to be favoured. Great crested newts do not require very high water quality, but are normally found in ponds with a circum-neutral pH. Great crested newts can be found in rural, urban and post-industrial settings, with populations less able to thrive where there are high degrees of fragmentation. Broad habitat type varies greatly, the most frequent being pastoral and arable farmland, woodland, scrub, and grassland. There are also populations in coastal dunes and shingle structures.

The connectivity of the landscape is important, since great crested newts often occur in metapopulations that encompass a cluster of ponds known as pondscapes: these can be defined as continuous habitats where there is a constant movement of species (not just newts) between still water-bodies. This helps ensure the survival of populations even if sub-populations are affected by, for example, pond desiccation or fish introductions. Pondscapes, which support large numbers of newts, are the most important great crested newt habitats not only nationally but also internationally (Watson, 2001).

2.2 Population and distribution
The great crested newt is widespread throughout much of England and Wales, but occurs only sparsely in south-west England, mid Wales and Scotland. It is absent from Northern Ireland. The total UK population is relatively large and is distributed over sites that vary greatly in their ecological character. One estimate has put the national population at around 400,000 animals in 18,000 breeding sites. Many of the largest populations are centred on disused mineral-extraction sites, but lowland farmland forms the majority of great crested newt habitat in the UK. Climate may influence the range edge at the north of its distribution in Scotland, but other ecological or landscape factors such as pond density are probably more important in determining distribution across the main part of its British range.

Many regionally important meta-populations of great crested newt are present in Worcestershire, distributed throughout the county. Areas of particular importance include the Warndon area of Worcester, Redditch, Guarlford, Hallow, Castlemorton, Hanbury and Crowle. The average pond density in Worcestershire is 2.9 per 1km square whereas the landscapes within these areas contain what is known as 'core pondscapes' with pond densities of between 5 to 10 ponds or more per square kilometre.

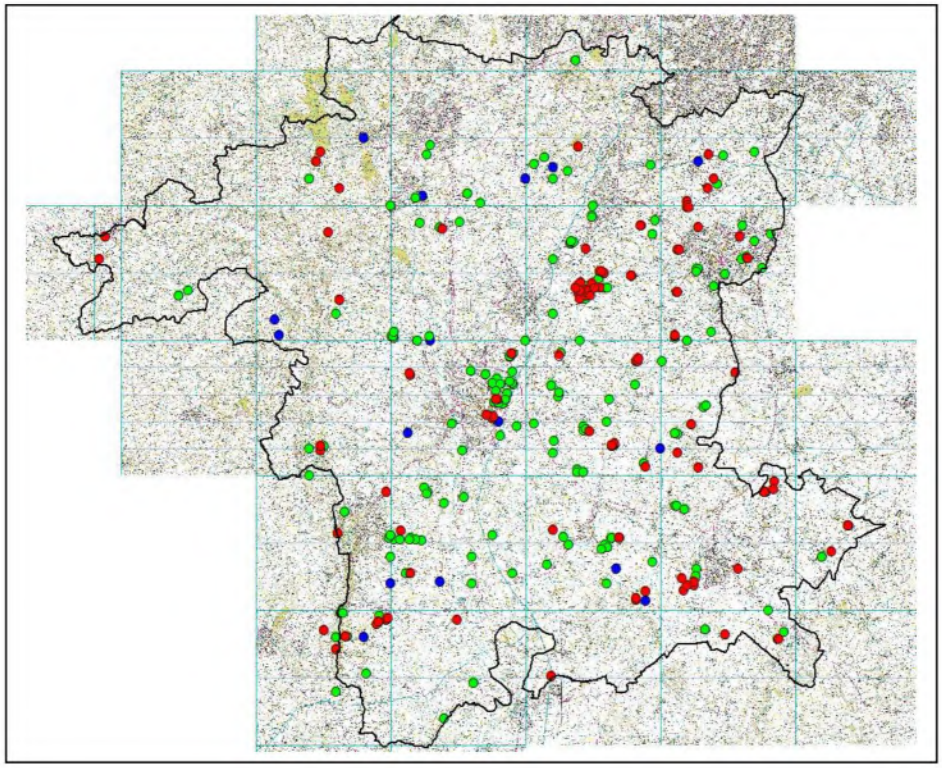

Figure 1. Great crested newt records in Worcestershire to 2007. Records pre-1979 are shown blue, 1980-1999 shown green and 2000-2007 shown red. Data provided by Worcestershire Biological Records Centre. *Note some data is displayed at hectad and tetrad level.*

2.3 Legislation

The great crested newt is listed on Annexes 2 and 4 of the Habitats Directive, the IUCN Red List and is protected under Schedule 5 of the Wildlife and Countryside Act.

2.4 Summary of important sites

Lyppard Grange Ponds SAC / SSSI is located in Warndon Villages on the outskirts of Worcester, a recent housing development on former pastoral farmland. The ponds are associated with good-quality terrestrial habitat and are a remnant of a formerly more widespread newt habitat when large numbers of ponds were maintained for agricultural purposes. The field ponds are now isolated within the development, which serves as public open space. The site was designated a SAC in 2005 as it supports one of the largest known breeding colonies of great crested newts in the country. A substantial population of *Triturus vulgaris* smooth newts also exists on the site, *Natrix natrix* grass snake has been recorded, and the ponds also support a rich and diverse variety of aquatic

invertebrates including the nationally rare *Hydrochus elongatus,* a scavenger water beetle.

Wychavon District has been found to have the highest overall density of great crested newts in the county, with a percentage occurrence in those ponds surveyed of 62%. One of the best examples from within this area is Hanbury parish, where 32 ponds were surveyed and 26 of these found to contain great crested newts (Watson, 2000). 26 of the ponds surveyed were on the National Trust's Hanbury Hall estate and 21 of these contained great crested newts (Watson, 2001).

3. Current factors affecting the species

- Deliberate infilling, natural succession and development has resulted in damage to or destruction of many breeding ponds and has caused habitat fragmentation where populations become isolated and more vulnerable to change.
- Most of the life cycle of the newt is spent on land and so loss and damage to terrestrial habitat leads to smaller population size and may threaten the viability of a meta-population.
- Seepage into breeding ponds by septic drainage, fertilisers, biocides and other toxic chemicals affects breeding or greatly reduces newt recruitment. Excessive nutrients cause eutrophication leading to algal blooms, a reduction of aquatic plants and an increase in silt deposition.
- The salt found in road run-off is particularly toxic for amphibians, with even very low concentrations preventing newts from breeding, and in high concentrations killing adult newts.
- The introduction of fish and domestic waterfowl can eliminate a great crested newt population through predation and by removal of the aquatic vegetation on which the newts lay their eggs.
- Drainage and water abstraction leads to an increase in pond desiccation. Great crested newts require pond water to be present for a four month period during spring and summer. The lowering of the water table will reduce the ability of newts to breed in some sites and may threaten the viability of others.

4. Current Action

4.1 Local protection

Lyppard Grange ponds on the outskirts of Worcester were designated a SSSI in 2000 and a SAC in 2005 due to the presence of a large breeding population of great crested newts.

4.2 Site management and programmes of action

The Herpetological Conservation Trust has published a guide for landowners on choosing Environmental Stewardship options to benefit great crested newts. This is available from www.herpconstrust.org.uk.

Worcester City Council manages Lyppard Grange Ponds as a Local Nature Reserve. A three-year grant was recently secured from the Heritage Lottery Fund to carry out conservation work on the site and run a series of community events and education programmes.

The National Trust is currently restoring some of the ponds within Hanbury Park, many of which contain great crested newts.

4.3 Survey, research and monitoring

In 1986 the National Amphibian Survey was launched with funding from the Nature Conservancy Council and this stimulated a great deal of work on the distribution and abundance of amphibians, in particular great crested newts, in Worcestershire. In 1987 an amphibian survey was conducted of the Warndon Parish in Worcester City of which 410ha of land had been scheduled for development. The 45 ponds present within this area were closely studied throughout the 10-year period of the development and great crested newts were recorded from 25 (Watson, 2000). The ponds at Lyppard Grange, with 187 individual adult great crested newts recorded in one evening, is still the best-recorded site in Worcestershire. From the mid 1990s onwards attention was focused on other parts of the county to find out if this high rate of occurrence was part of a pattern experienced elsewhere. In total, between 1987 and 1999, 387 Worcestershire ponds were surveyed at least once for amphibians. A total of 335 of those ponds contained one or more species of amphibians, representing 86% of the total. An impressive 190 of those ponds surveyed contained great crested newts: a 49% occurrence rate for this species. Based on this data there may be 2500 great crested newt ponds in the county.

The **National Amphibian and Reptile Recording Scheme** (NARRS) is a national wildlife-monitoring project to measure trends in the conservation status of all UK species of amphibian and reptile. NARRS is being led by The Herpetological Conservation Trust (HCT) in partnership with other organisations. It will provide information on the status of amphibians and reptiles in Britain, but will also raise awareness and appreciation of these species and encourage people to get involved in recording and conservation. NARRS will coordinate and combine data from a number of surveys including the National Amphibian Survey that is training volunteers to carry out pond surveys for the UK's amphibians: great crested newt, smooth newt, *Triturus helveticus* palmate newt, *Bufo bufo* common toad and *Rana temporaria* common frog.

5. Associated Plans

Urban, Ponds and Lakes.

6. Vision Statement

That Worcestershire continues to be a county held in national regard for the significance of its great crested newt populations and that the pondscape habitat mosaic across our countryside is valued and enhanced whenever opportunity allows.

7. Targets

Target Type	Target Text	Baseline value	Target Value	Target Timescale
Range	Maintain the number of ponds in Worcestershire containing great crested newts	2500	2500	2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC GCN FR 01	**4.11**	Secure funding to carry out a re-survey of Worcestershire ponds that were surveyed during the 1990s for great crested newts and other amphibians.	Worcestershire	2012	WCC	WWT
WRC GCN SU 01	**13.2**	Repeat the county-wide survey undertaken during the 1990s to assess changes in great crested newt distribution.	Worcestershire	2017	WCC	WWT

WCC – Worcestershire County Council **WWT** – Worcestershire Wildlife Trust

References and further information

Watson, W (2000). *The Status and Distribution of Great Crested Newts in Worcestershire 2000: part 1*. Worcestershire Record Issue 9.

Watson, W (2001). *The Status and Distribution of Great Crested Newts in Worcestershire 2000: part 2*. Worcestershire Record Issue 11.

www.narrs.org.uk

www.herpconstrust.org.uk

Twaite and Allis Shad
Alosa fallax and Alosa alosa
Species Action Plan

1. Introduction
Twaite and Allis shad are both priority UK BAP species.

2. Current Status
2.1 Ecology and habitat requirements
Alosa fallax twaite shad and *Alosa alosa* allis shad are anadromous (they reproduce in freshwater but grow in the sea) and are members of the herring family. Adult Twaite shad from the Severn estuary range between 23-45cm in length whilst Allis shad are approximately 40cm. Both species are also characterised by a membrane partially covering each eye and large, circular, weakly attached scales that appear serrated under the belly. Although little is known about the preferred habitat of shad whilst at sea, both are recorded in coastal waters and estuaries around the UK throughout the year.

Prior to moving into freshwater to begin breeding they congregate in large schools in or near estuaries. They enter large rivers to spawn, travelling up to 150 km, and there is some evidence to suggest they return to their natal river by detecting the 'odour'. The Severn is one of only four rivers in the UK known to support spawning Twaite shad. Spawning is believed to be limited to as far as Powick Weir on the River Teme and Diglis Weir on the River Severn. The Allis shad is sometimes caught in the Severn but there are no known spawning grounds in the UK, however, historically it was known to breed in the Severn and there is a slight possibility that it shared spawning grounds with the Twaite shad.

At maturity, adult Twaite shad stop feeding and gather in the estuaries of suitable rivers in early summer (April and May), moving upstream to spawn from mid-May to mid-July. The males usually move upstream first, followed by the females. Spawning is a noisy affair and takes place near the surface in flowing water above appropriate areas of clean stones and gravel, amongst which the eggs sink. The eggs, which measure 1.5–3.5 mm in diameter, take about four to six days to hatch. The young fish then drop quickly downstream in the current to the quieter waters of the upper estuary where they start to feed and grow. Relative fecundity has been reported to range from 42,540 to 302,358 eggs per kg: 139,479 in the River Severn (Aprahamian, unpublished).

Growth in the first year is fairly rapid; juveniles can reach 50 mm in six months and 100–150 mm after one year (Aprahamian, 1988). Thereafter, growth is steady and most fish reach 200–250 mm after two years and 250–300 mm after three years. The males start to mature after three years and therefore spawn with older and larger females at first. The females do not start to mature until they are about five years old. The young fish feed mainly on invertebrates, especially estuarine zooplankton, but as they grow they take larger crustaceans of various types (for example shrimps and mysids) and also small fish (Aprahamian, 1989; Assis *et al*. 1992; Taverny, 1991). Adults feed to an appreciable extent on other fish, especially the young of other members of the Clupeidae, such as *Sprattus sprattus* sprat and *Clupea harengus* herring (Maitland & Lyle 1995). Unlike Allis shad, which normally spawn only once, Twaite shad may spawn several times in their lives (Aprahamian, 1982).

Although spawning sites are not necessarily very deep, they are always in places where the river is still tens of metres wide. In Britain, the narrowest site in which spawning has been recorded (on the River Teme) is around 20m wide (M Aprahamian pers. com.) but spawning sites are typically 30–60m wide (Caswell & Aprahamian, 2001).

2.2 Population and distribution

The Twaite shad occurs along most of the west coast of Europe, from southern Norway to the eastern Mediterranean Sea, and in the lower reaches of large accessible rivers along these coasts. Spawning populations have been recorded from Estonia, Germany (especially the Elbe), Britain, Ireland, western France, Spain, Portugal, Morocco, Belgium and the Netherlands (ssp. *Alosa fallax fallax*), southern France and Italy (ssp. *Alosa fallax rhodanensis*) and much of the eastern Mediterranean.

In Britain, spawning populations of Twaite shad are still found in the rivers Severn, Wye, Usk and Tywi and appear to be reasonably stable (Aprahamian *et al*. 1998). Remnant populations may still be present in other rivers (Maitland, 1993, 1995), especially where spawning takes place in estuaries.

2.3 Legislation

Twaite shad is listed on Appendix II of the Bern Convention and Annex IVa of the EC Habitats Directive. It is also protected under schedule 2 of the Conservation (Natural Habitats etc) Regulations 1994 and schedule 5 of the Wildlife and Countryside Act 1981. Allis shad is listed on Appendix II of the Bern Convention and Annexes II and V of the EC Habitats Directive. It is protected under Schedules 5 and 9 of the Wildlife and Countryside Act 1981.

The Water Framework Directive is a European Union Directive designed to protect and improve the environmental condition of all waters, including rivers, lakes, groundwater, estuaries and coastal waters to 1 nautical mile. It also encourages the water environment to be managed in a consistent way throughout the European Union. The Directive is implemented through river basin planning, which involves setting environmental objectives (table 1) for all groundwater and surface water bodies (including estuaries and coastal waters) within a river basin district, and then devising a programme of measures to meet those objectives. Worcestershire falls within the Severn River Basin District.

Table 1. Water Framework Directive (WFD) environmental objectives.

SURFACE WATERS	GROUNDWATERS
Prevent deterioration in status	Prevent deterioration in status
Aim to achieve Good Status by 2015	Aim to achieve Good Status by 2015
Reduce pollution from priority substances; and cease discharges, emissions and losses of priority hazardous substances	Prevent or limit input of pollutants into groundwater
Comply with objectives and standards for relevant protected areas	Implement the measures necessary to reverse any significant and sustained upward trend in pollutant concentrations
	Comply with objectives and standards for relevant protected areas

The Salmon and Freshwater Fisheries Act 1975 does not include shad as migratory fish. This was drawn to the attention of an independent (from Defra) group set up to review policy and legislation on Salmon and Freshwater

Fisheries. This group reported to Ministers in Autumn 1999 and one of its recommendations was that shad should be included in any future fisheries legislation. Currently no Parliamentary time has been identified for this new legislation.

2.4 Summary of important sites

After returning from the sea, the critical habitat requirements are:

- March–June: a clear migration route to the spawning grounds, with suitable river flows and no barriers.

- Late May–late June: suitable resting pools and clean gravels at the spawning areas.

- Mid June–late September: slow-flowing nursery areas for juveniles in fresh water above the estuary after hatching (Menneson-Boisneau *et al*. 1986; Belaud *et al*. 1991; Prouzet *et al*. 1994).

The most important Twaite shad spawning sites are on the River Teme from Powick Weir downstream to its confluence with the River Severn. The gravel substrate below Diglis Weir on the River Severn is currently the upstream limit for this species. Spawning has also been recorded at Maisemore Weir, Gloucester, in low flow years and it is likely that spawning is attempted over any suitable gravel substrate below Diglis Weir and in the estuary but this has not been confirmed. It is likely that few if any Allis shad successfully spawn in the Severn as this species favours longer migrations into fresh water and navigation weirs currently restrict this.

3. Current factors affecting the species

- Shad migrate in shoals and successful migration over obstructions is dependent on exacting conditions being met. Shad will only migrate over an obstruction if laminar flows are present and there is sufficient depth of water to allow a shoal to pass together. This means that unless a weir is flooded out by tide the only fish pass designs that are recognised as effective are pool & traverse, vertical slot, pool and weir and fish lifts. All these fish pass types are expensive to construct.

- Shad are more sensitive than other estuarine species to water quality, with research suggesting a minimum requirement of Environment Agency Class B. In low flow summer conditions water quality may deteriorate. More research is required into shad tolerance to nitrate / nitrite and total phosphorus levels, which are relatively higher on the Severn than in some continental rivers that hold good shad populations (rivers Loire & Garonne). The impact of dredging needs to be continually accessed in relation to timing of works and localised water quality issues.

- Shad have been shown to be sensitive to acoustic noise. High frequency noise (70 – 300Khtz) can prove a complete barrier to migration, with shad adopting a flee response. Acoustic noise at low frequency (below 2Khtz), often associated with in-river construction (e.g. piling), can cause avoidance but shad are not believed to be any more sensitive than many other fish species. Acoustic noise sources need to be assessed at the planning and consent stage and their potential impacts mitigated for, particularly during the key upstream migration phase.

- Physical modification of the river has removed important habitat needed by shad. Navigation considerations have removed the '*pool/riffle'* sections from the accessible river, while farming practices have removed much of the valuable riparian habitat needed by juvenile shad on their drift downstream. Channalisation caused by the Severn Navigation and modifications for Flood Risk Management purposes also removes many of the slack water areas important for providing food for juvenile shad.

4. Current Action

4.1 Local protection

There are currently no sites in Worcestershire that are protected specifically for shad. The River Teme is an SSSI over its whole length and this includes the important spawning area downstream of Powick Weir.

The Severn Estuary is a possible Special Area of Conservation (pSAC)* for both shad species under the Habitats Directive. This also gives protection for features necessary for shad in Worcestershire, as it is a requirement that no activities in areas frequented by shad that lie outside of the pSAC should lead to deterioration within the pSAC.

*** Possible SACs (pSACs)** are sites that have been formally advised to UK Government, but not yet submitted to the European Commission.

4.2 Site management and programmes of action

No specific sites are managed for shad within Worcestershire.

4.3 Survey, research and monitoring

A programme of recording catches and sightings of shad from the public was instigated by the Environment Agency and Natural England. Response to this has been poor and the shortening of the commercial salmon netting season in the estuary means the best source of run size and timing data has been lost. Continued examination of the intake skip at Oldbury Power Station now remains our best indication of run timing. It is hoped to improve monitoring of returning adults with the cooperation of salmon rod anglers at Diglis and Upper Lode Weir. The Environment Agency now has a shad monitoring methodology and this will hopefully allow active monitoring at key sites.

5. Associated Plans

Rivers and Streams.

6. Vision Statement

To expand the range and abundance of Twaite shad to their historic range prior to the establishment of the Severn Navigation (1850's).

The short-term vision is to open up ideal spawning habitat on the River Teme that was probably blocked to shad migration prior to the Severn Navigation. By reconnecting the spawning habitat it is hoped that Allis shad will return to breed in the Severn, although artificial stocking of this species may be required to achieve this.

7. Targets

Target Type	Target text	Baseline value	Target value	Target Timescale
Range	Restore the available spawning range to pre-Severn Navigation limits. Access up river is currently only as far as Diglis Weir on the River Severn (c. 27km within county boundary) and Powick Weir on the River Teme (c. 3km upstream from its confluence with the Severn).	30km of accessible river within the county boundary	31km or more of accessible river within the county boundary	By 2017

8. Actions

Action Code	Action Category	Action Text	Location	Complete Action By	Lead Organisation	Support Organisations
WRC SHD CA 01	**2.11**	Prepare guidelines for landowners, land managers and local authorities on how to incorporate the needs of shad into management works. Disseminate best practice through catchment sensitive farming officers and FWAG.	Severn catchment	2012	EA	FWAG
WRC SHD CA 02	**2.15**	Arrange one workshop for conservation staff and land managers to explain the ecology, distribution and known requirements of shad.	Worcestershire	2010	EA	EA NE
WRC SHD CP 01	**3.15**	Increase public awareness of shad and the relevant conservation issues by producing a leaflet/poster explaining biology, ecology and distribution of shad in Worcestershire.	Worcestershire	2010	EA	WCC
WRC SHD HC 01	**7.6**	Produce costed, timetabled plans for four fish passes (at Diglis, Bevere, Holt, Lincomb weirs) with a view to allowing shad passage up the River Severn past Worcester by 2012 and past Shrewsbury by 2017.	Worcestershire	2012	BW	EA NE
WRC SHD HC 02	**7.6**	Produce costed plans with timetables for implementation of a fish pass at Powick Weir with a view to allowing shad passage up the River Teme.	Worcestershire	2012	EA	NE
WRC SHD HS 01	**6.6**	Consent to and follow best practice in all dredging activities within the River Severn during	Worcestershire	2017	BW	EA

		key migration periods (April to September).				
WRC SHD HS 02	**6.17**	Give appropriate consideration to the needs of adult and juvenile shad in any activities that could significantly affect river flows between May and September (e.g. CAM process, Drought Orders).	Severn catchment	2008	EA	STW
WRC SHD PL 01	**9.6**	Lobby for modification of Salmon and Freshwater Fisheries Act 1975 to ensure inclusion of both shad species as migratory fish and to encourage the provision of shad passes.	National	2012	EA	
WRC SHD PL 02	**9.17**	Highlight the migration of fish species at navigation weirs as a significant concern in the first round of the WFD consultation and seek to ensure an acceptable policy outcome for this issue.	Worcestershire	2012	EA	
WRC SHD PL 03	**9.8**	Influence the development control and consenting process to insure no further loss of habitat or access to spawning grounds, particularly in relation to acoustic noise sources and water quality.	Worcestershire	2017	EA	
WRC SHD PL 03	**9.8**	Influence the development control and consenting process to insure no further loss of habitat or access to spawning grounds, particularly in relation to acoustic noise sources and water quality.	Worcestershire	2017	WCC	
WRC SHD RE 01	**10.1**	Review existing or planned non-invasive flow measuring gauges within the river for the impact of acoustic noise on shad. Some 'Doppler' flow profilers work in the 200khtz range that causes a total barrier to migrating shad.	Severn catchment	2010	EA	
WRC SHD RE 02	**10.1**	Undertake further research into behavioural avoidance of acoustic noise sources, at both high and low frequencies.	Severn catchment	2010	EA	
WRC SHD RE 03	**10.1**	Continue assessment of the impact of entrainment mortality on juvenile shad populations at intake screens, notably Oldbury	Severn catchment	2017	EA	BNFL STW

		Power Station.				
WRC SHD RE 04	**10.1**	Identify, characterise and obtain quantitative information on spawning sites for Twaite Shad and relate these to habitat models such as RHS to help predict location of spawning. Use this to identify potential spawning sites for Allis Shad.	Worcestershire	2010	EA	NE
WRC SHD RE 05	**10.1**	Obtain information from national sources on shad behaviour in fresh water to assist with identifying habitat features, site faithfulness and recruitment success within Worcestershire.	Worcestershire	2012	EA	NE
WRC SHD SM 01	**12.1**	Influence the installation of gratings at any new intakes in waters frequented or likely to be inhabited by shad.	Severn catchment	2017	EA	
WRC SHD SM 02	**12.3**	Produce map of potential spawning locations over the whole Severn catchment using GIS, incorporating historical distribution data.	Severn catchment	2012	EA	NE
WRC SHD SU 01	**13.8**	Collate historical distribution and catch information as baseline data from Severn Fishery District Board of Conservators reports 1861 onwards.	Severn catchment	2008	EA	NE
WRC SHD SU 02	**13.4**	Undertake reviews, at 5-year intervals, of the distribution and status of shad on the River Severn through active monitoring of adults and juveniles.	Worcestershire	2017	EA	
WRC SHD SU 03	**13.6**	Encourage anglers to record and release shad when encountered by designing appropriate leaflet and circulating to salmon anglers at Upper Lode and Diglis Weirs.	Worcestershire	2008	EA	

EA - Environment Agency
NE - Natural England
BW - British Waterways
WWT - Worcestershire Wildlife Trust
WCC - Worcestershire County Council
FWAG - Farming and Wildlife Advisory Group
BNFL - British Nuclear Fuels Limited
STW - Severn Trent Water Plc

References and further information

Aprahamian MW (1982). *Aspects of the biology of the twaite shad (*Alosa fallax*) in the rivers Severn and Wye*. Unpublished PhD thesis, University of Liverpool.

Aprahamian MW (1988).The biology of the twaite shad *Alosa fallax fallax* (Lacépède) in the Severn Estuary. *Journal of Fish Biology* 33A, 141-152.

Aprahamian MW (1989). The diet of juvenile and adult twaite shad *Alosa fallax fallax* (Lacépède) from the rivers Severn and Wye (Britain). *Hydrobiologia* 179, 173–182.

Aprahamian MW, Lester SM and Aprahamian MW (1998). *Shad conservation in England and Wales*. Environment Agency Technical Report W110, 1–124.

Aprahamian MW and Aprahamian CD (2001).The influence of water temperature and flow on year-class strength of twaite shad (*Alosa fallax*) from the River Severn, England. *Bulletin Français de la Pêche et de la Pisciculture* 362/363, 953-972

Aprahamian MW, Baglinière JL, Sabatié R, Alexandrino P and Aprahamian CD (2002). Alosa alosa *and* Alosa fallax *spp.: Literature review and bibliography*. Environment Agency R&D Technical Report W1-014. Environment Agency, Swindon.

Assis CA, Almeida PR, Moreira F, Costa JL and Costa MJ (1992). Diet of the twaite shad *Alosa fallax* (Lacépède) (Clupeidae) in the River Tagus estuary, Portugal. *Journal of Fish Biology* 41, 1049–1050.

Belaud A, Cassou-Leins F, Cassou-Leins JJ and Labat R (1991). La ponte d'un poisson migrateur de la Garonée la grande alose (*Alosa alosa* L.). *Ichtyophysiologica Acta* 14, 123–126.

Caswell PA & Aprahamian MW (2001). Use of River Habitat Survey to determine the spawning habitat characteristics of twaite shad (*Alosa fallax* fallax). *Bulletin Français de la Pêche et de la Pisciculture* 362/363, 919–929.

Maitland PS (1993). *Sites in Great Britain for freshwater and estuarine fish on the EC Habitats and Species Directive*. Report to Joint Nature Conservation Committee, Peterborough.

Maitland PS (1995). *The ecological requirements of threatened and declining freshwater fish species in the United Kingdom*. Report to Joint Nature Conservation Committee, Peterborough.

Maitland PS and Lyle AA (1995). *Shad and smelt in the Cree Estuary, SW Scotland.* Report to Scottish Natural Heritage, Edinburgh.

Maitland PS & Hatton-Ellis TW (2003). *Ecology of the Allis and Twaite Shad.* Conserving Natura 2000 Rivers Ecology Series No. 3. English Nature, Peterborough.

Mennesson-Boisneau C and Boisneau P (1986). *Recherches sur les Aloses* (Alosa *spp*.) *dans le bassin de la Loire: migration repartition reproduction caracteristiques biologiques et taxonomie des aloses* (Alosa *spp*.). Unpublished DSc thesis, Université de Rennes.

Prouzet P, Martinet JP and Badia J (1994). Caracterisation biologique et variation des captures de la grande aloes (*Alosa alosa*) par unite d'effort sur le fleuve Adour (Pyrenees Atlantiques France). *Aquatic Living Resources* 7, 1–10.

Taverny C (1991). *Pêche biologie ecologie des Aloses dans le Systeme Gironde-Garonne-Dordogne.* Unpublished PhD thesis, University of Bordeaux.

Thiel R, Sepulveda A and Oesmann S (1996). Occurrence and distribution of twaite shad (*Alosa fallax* Lacépède) in the lower Elbe River Germany. In: Kirchhofer A and Hefti D (eds). *Conservation of endangered freshwater fish in Europe*. Birkhauser, Basel, 157–168.