Biodiversity Action Plan
Priority Habitat Descriptions Applicable to Oxfordshire

Contents

Introduction

After two years of work involving in excess of 500 people, the proposed UK List of Priority Species and Habitats was presented in a UK BAP website report in June 2007. Following recommendation from the Priorities Species and Habitats Review Working Group and the Priorities Review Group, the Governments of all four UK administrations adopted the recommendations of experts and published the UK list of Priority Species and Habitats in August 2007.

This list contains 1149 species and 65 habitats that have been listed as priorities for conservation action under the UK Biodiversity Action Plan (UK BAP). This was the first full review of the UK BAP priority list and provided an opportunity to take account of emerging and continued priorities for action, conservation successes, and new information gathered since the original list of UK BAP priorities was established.

This document describes each of the 65 UK BAP priority habitats, which span terrestrial, freshwater and marine environments. It is anticipated that these definitions will be described in more detail in due course, albeit that their overall scope will not be significantly affected by this. Even as this report is being published some of the terrestrial, freshwater and marine habitat definitions are being refined.

For those habitats for which pre-existing Habitat Action Plans are available, as written in 1995 (see http://www.ukbap.org.uk/Habitats.aspx), and where the scope of the habitat description remains unchanged, a weblink is provided to the relevant action plan; these should be read with consideration that they reflect the original status of the habitats when the plans were first written in 1995. In addition, a summary of each definition, derived from the HAP, is included in this document.

For those terrestrial and freshwater habitats which are either new priorities or where changes have been made to the original habitat scope (as given in the 1995 action plan), the nature of the changes is outlined or the new description is given in full. This information has been taken from Annex 5 of the UK BAP Species and Habitats Review Report which provides the detail and reasoning behind the changes (available at http://www.ukbap.org.uk/bapgrouppage.aspx?id=112).

The UK BAP Marine Steering Group is still finalising the descriptions of the newly recognised priority marine habitats; detail on these will be provided in due course.

Habitat Descriptions

Aquifer Fed Naturally Fluctuating Water Bodies

The definition of this habitat remains unchanged from the pre-existing Habitat Action Plan (http://www.ukbap.org.uk/UKPlans.aspx?ID=24) a summary of which appears below.

Physical and chemical status

This habitat category consists of natural water bodies which have an intrinsic regime of extreme fluctuation in water level, with periods of complete or almost complete drying out as part of the natural cycle. They have no inflow or outflow streams at the surface, except at times of very high water level, when temporary out-flows may develop. Instead, they are directly connected to the underlying groundwater system and periodically empty and are recharged via swallow holes or smaller openings in their beds.

There are two known variants of the habitat in the UK: turloughs, found over Carboniferous limestone in Northern Ireland and Wales, and fluctuating meres, which occur over chalk in the Norfolk Breckland. Turloughs are distinguished by winter flooding and a dry floor, apart from small residual pools, in summer. Under one definition, a water body qualifies as a turlough only if winter flooding exceeds a depth of 0.5m. There may be underground connections between neighbouring turloughs. The fluctuating meres of Norfolk do not have a regular annual rhythm of emptying and recharge. Instead, there is a complex pattern of drying out and refilling, sometimes with a stretch of several years during which a mere may remain dry, followed by a prolonged period when water is constantly present, although its depth may vary from a few centimetres to 6 metres. The water level in both turloughs and meres reflects the height of the water table, which periodically rises above the surface of the bed. The response to groundwater fluctuations in turloughs is rapid, whereas that in the meres is highly lagged, with each mere having an individual periodicity.

This is naturally a very rare habitat, both in the UK and internationally, although the Republic of Ireland has at least 60 unmodified turloughs 10 ha or more in extent. Three intact turloughs have so far been found in Co. Fermanagh, Northern Ireland, possibly the most northerly water bodies of this kind in Europe, and a single example (Pant-y-llyn) has been recognised in South Wales. Six fluctuating meres have been identified in the Norfolk Breckland, but some of the smaller pools nearby may also be fluctuating meres. There have been suggestions that aquifer fed naturally fluctuating water bodies may occur elsewhere in the UK, including Scotland, but none has yet been positively identified. Conversely, there are probably a number of aquifer fed water bodies which were once naturally fluctuating but have been deliberately modified and so have lost most of their biological interest.

Taking the area of maximum inundation, the total extent of the nine UK waters at present known to fit the definition of aquifer fed naturally fluctuating water bodies is approximately 10 ha in Northern Ireland, 1 ha in Wales and 20 ha in England.

The nutrient status of these lakes varies from area to area and the water quality reflects that of the groundwater. The water of turloughs and fluctuating meres is hard because the underlying rock is calcareous. The Irish and Welsh turloughs lie naturally in the middle of the trophic range for the UK (mesotrophic) and the Breckland meres are somewhat richer (mildly eutrophic).

Biological status

The concentric zonation of vegetation in these lakes is strikingly obvious, especially when they are in their dry phase. Then their basins are partly or completely occupied by grassland, often with silverweed *Potentilla anserina* abundant, although turloughs in Northern Ireland retain some permanent swampy pools. Water chickweed *Myosoton aquaticum* and stinging nettle *Urtica dioica* are typical of the damp centre of Breckland mere basins, with a broad band of reed canary grass *Phalaris arundinacea* at a slightly higher level. Woodland and

scrub - mainly willow, birch, alder, ash or hazel - grows around the margins of most of the meres and turloughs.

As a result of the fluctuating water levels, aquatic vegetation is absent (or, in Northern Ireland, restricted to residual pools) at some periods in the cycle of these lakes and abundant at others. An element common to both turloughs and meres is the prevalence of aquatic and semi-aquatic mosses such as *Fontinalis antipyretica* and *Cinclidotus fontinaloides*, which are more resistant to desiccation than higher (vascular) aquatic plants. Rare plants of the inundation zone include the moss *Physcomitrium erystomum* in the meres and the rare fen violet *Viola persicifolia* in the turloughs of Northern Ireland. Although some permanent pools in the Northern Irish turloughs support white water lily *Nymphaea alba* and other water plants, in the Breckland meres, where deep flooding can occur for long periods, aquatic vegetation becomes better established and more diverse than in most turloughs. Water plants typical of the meres are shining pondweed *Potamogeton lucens* and various-leaved pondweed *Potamogeton gramineus*, sometimes accompanied by their hybrid, long-leaved pondweed *Potamogeton x zizii*, which is scarce nationally.

The aquatic fauna of these fluctuating water bodies is adapted to intermittent desiccation. Fish are generally absent, but a range of amphibians can be found, including the protected great crested newt *Triturus cristatus* in the Breckland. Invertebrates include many insect species such as dragonflies, water boatmen and diving beetles, which are highly mobile and are therefore able colonisers. Typically, there is also a rich assemblage of micro-crustaceans such as water fleas, which have resting stages that can remain viable in the soil during dry phases. Snails such as the marsh snail *Lymnaea palustris*, which breathe air and can persist during periods of drought under stones and in damp vegetation, are common in both turloughs and meres. Numerous rare invertebrates have been recorded, including the large mussel-shrimp (ostracod) *Cypris bispinosa*, the small diving beetle *Bidessus unistriatus* and the scarce emerald damselfly *Lestes dryas* from the Breckland meres. During their wet phase the meres support breeding coot *Fulica atra*, tufted duck *Aythya fuligula*, mallard *Anas platyrhynchos*, shelduck *Tadorna tadorna*, pochard *Aythya ferina* and gadwall *Anas strepera*.

Arable Field Margins

The definition of this priority habitat has been amended from the pre-existing Habitat Action Plan for cereal field margins (http://www.ukbap.org.uk/UKPlans.aspx?ID=8).

Arable field margins are herbaceous strips or blocks around arable fields that are managed specifically to provide benefits for wildlife. The arable field must be in a crop rotation which includes an arable crop, even if in certain years the field is in temporary grass, set-aside or fallow. Arable field margins are usually sited on the outer 2-12m margin of the arable field, although when planted as blocks they occasionally extend further into the field centre.

In general terms, the physical limits of the arable field margin priority habitat are defined by the extent of any management undertaken specifically to benefit wildlife. Single payment cross-compliance margins are considered as part of the boundary habitat and are not part of the arable field margin habitat.

The outer edge refers to the edge closest to the field boundary. Where there is a living field boundary (hedgerow or line of trees), any herbaceous vegetation within 2m from the centre of the living boundary is considered to be part of the living boundary habitat. The arable field margin outer boundary starts at the edge of this boundary habitat. Where the boundary is a ditch or other water body, any herbaceous vegetation within 2m from the centre of the water body (or one metre from the edge of the water body if this extends further into the field) is considered to be part of the boundary habitat. The arable field margin outer boundary starts at the edge of this boundary habitat. Where the boundary is non-living (e.g. a fence or wall), the outer edge is defined by the extent of any management undertaken specifically to benefit wildlife. Where the habitat comprises a block of, for example, wild bird seed mixture, it has only an outer edge.

The inner edge refers to the edge closest to the centre of the field. In all cases, the inner edge is defined by the extent of any management undertaken specifically to benefit wildlife.

The following margin types are included:

- Cultivated, low-input margins. These are areas within arable fields that are cultivated periodically, usually annually or biennially, but are not sprayed with spring/summer insecticides and not normally sprayed with herbicides (except for the control of injurious weeds or problem grasses such as creeping thistle, black grass, sterile brome or wild oat). Cultivated, low-input margins include conservation headlands and land managed specifically to create habitat for annual arable plants.
- Margins sown to provide seed for wild birds. These are margins or blocks sown with plants that are allowed to set seed and which remain in place over the winter. They may be sown with cereals and/or small-seeded broad-leaved plants or grasses but areas sown with maize are excluded as they are of lower value for wild birds.
- Margins sown with wild flowers or agricultural legumes and managed to allow flowering to provide pollen and nectar resources for invertebrates.
- Margins providing permanent, grass strips with mixtures of tussocky and fine-leaved grasses. Areas of grass established as cross compliance requirements (see below) are excluded from this definition, but all other strips of grassland created by sowing or natural regeneration, such as field margins or beetle banks, are included.

Separate targets will be set for each margin-type, reflecting the varying priorities for conservation action.

The following margin types are excluded:

- Although set-aside, biomass and organic crops can have incidental benefits for wildlife in arable fields, these areas are not managed specifically for wildlife and are therefore excluded from the definition.
- Margins established as cross compliance requirements under the Single Payment Scheme (in England and Scotland) or as mandatory requirements of an Entry-Level Agri-environment Scheme (in Wales and likely in Northern Ireland) are excluded. These

margins, where present, would be included as part of the priority hedgerow habitat, where put in place to protect the hedgerow.

- Whole-field options such as over-wintered stubbles (with or without a fallow) and in-field options such as skylark plots are currently excluded from the definition of priority habitat, although their value for wildlife is acknowledged and their status will be reviewed in due course.

Discussions to develop a more detailed definition continue in 2008 and may include:

Areas of arable land that meet one or more of the following criteria:

- Hosting a Nationally Scarce or Rare arable plant species.
- Having a mean within-crop plant species richness of (say) >18 per 100m square (upper quartile, CS 2000 arable field margin plots).
- Regularly supporting a breeding population of the following crop-nesting bird species with a restricted distribution: corn bunting, reed bunting or lapwing.
- Regularly supporting a breeding population of the following bird species with a restricted distribution which nest in hedges or grass margins and feed within the arable field: grey partridge, tree sparrow, turtle dove.
- Used for foraging by any of the following bumblebee species: Shrill Carder bee, Common Carder bee, Large Garden Bumblebee, Great Yellow Bumblebee (Scotland).

Coastal and Floodplain Grazing Marsh

The definition of this habitat remains unchanged from the pre-existing Habitat Action Plan (http://www.ukbap.org.uk/UKPlans.aspx?ID=9) a summary of which appears below.

Grazing marsh is defined as periodically inundated pasture, or meadow with ditches which maintain the water levels, containing standing brackish or fresh water. The ditches are especially rich in plants and invertebrates. Almost all areas are grazed and some are cut for hay or silage. Sites may contain seasonal water-filled hollows and permanent ponds with emergent swamp communities, but not extensive areas of tall fen species like reeds; although they may abut with fen and reed swamp communities.

The exact extent of grazing marsh in the UK is not known but it is possible that there may be a total of 300,000 ha. England holds the largest proportion with an estimate in 1994 of 200,000 ha. However, only a small proportion of this grassland is semi-natural supporting a high diversity of native plant species (5,000 ha in England, an estimated 10,000 ha in the UK).

Grazing marshes are particularly important for the number of breeding waders such as snipe *Gallinago gallinago*, lapwing *Vanellus vanellus* and curlew *Numenius arquata* they support. Internationally important populations of wintering wildfowl also occur including Bewick swans *Cygnus bewickii* and whooper swans *Cygnus cygnus.*

Eutrophic Standing Waters

The definition of this habitat remains unchanged from the pre-existing Habitat Action Plan (http://www.ukbap.org.uk/UKPlans.aspx?ID=23) a summary of which appears below.

Physical and chemical status

Eutrophic standing waters are highly productive because plant nutrients are plentiful, either naturally or as a result of artificial enrichment. These water bodies are characterised by having dense, long-term populations of algae in mid-summer, often making the water green. Their beds are covered by dark anaerobic mud, rich in organic matter. The water column typically contains at least 0.035 mg L -1 total phosphorus (which includes phosphorus bound up in plankton and 0.5 mg L -1 or more total inorganic nitrogen (mainly in the form of dissolved nitrates). Many lowland water bodies in the UK are now heavily polluted, with nutrient concentrations far in excess of these levels although there is some geographical variation in the extent of the enrichment. This action plan covers natural and man made still waters such as lakes, reservoirs and gravel pits but it excludes small pools, field ponds and brackish waters. It includes some waters, such as Lough Neagh, Northern Ireland, which have been enriched as a result of human activity and so have been forced along the trophic continuum from a mesotrophic to a eutrophic state. The biodiversity action plans for mesotrophic and eutrophic waters are therefore complementary and their implementation should be co-ordinated. Eutrophic waters are most typical of hard water areas of the lowlands of southern and eastern Britain, but they also occur in the north and west, especially near the coast.

There are no accurate estimates of the amount of eutrophic standing water in Great Britain. The total area of still inland water is estimated as 675 km^2 in England, 125 km^2 in Wales and 1604 km^2 in Scotland. Current work suggests that over 80% of this resource in England, some 40% in Wales and approximately 15% in Scotland is eutrophic. On this assumption, the area of eutrophic standing water in Great Britain would be about 845 km^2. Measurements made by the Environment and Heritage Service put the area of eutrophic standing water in Northern Ireland at approximately 940 km^2. The total UK area for eutrophic standing waters is therefore likely to be around 1785 km^2.

Biological status

In their natural state eutrophic waters have high biodiversity. Planktonic algae and zooplankton are abundant in the water column, submerged vegetation is diverse and numerous species of invertebrate and fish are present. Plant assemblages differ according to geographical area and nutrient

concentration but fennel-leaved pondweed *Potamogeton pectinatus* and spiked water-milfoil *Myriophyllum spicatum* are characteristic throughout the UK. Common floating-leaved plants include yellow water lily *Nuphar lutea* and there is often a marginal fringe of reedswamp, which is an important component of the aquatic ecosystems. A rare plant found in a few eutrophic waters is ribbon-leaved water-plantain *Alisma gramineum.*

Bottom-dwelling invertebrates such as snails, dragonflies and water beetles are abundant and calcareous sites may support large populations of the native freshwater crayfish *Austropotamobius pallipes*. Coarse fish such as roach *Rutilus rutilus*, tench *Tinca tinca* and pike *Esox lucius* are typical of eutrophic standing waters, but salmonids also occur naturally in some. Amphibians, including the protected great crested newt *Triturus cristatus*, are often present and the abundance of food can support internationally important bird populations. Loch Leven and Lough Neagh, for example, each support over 20,000 waterfowl, including large numbers of wintering whooper swan *Cygnus cygnus*. Loch Leven is nationally important for breeding ducks such as wigeon *Anas penelope*, gadwall *Anas strepera* and shoveler *Anas clypeata*, and Lough Neagh is of national importance for breeding great crested grebe *Podiceps cristatus*.

For centuries, periodic `blooms` of blue green algae, which may be natural phenomena, have been documented in Llyn Syfaddan (Llangorse Lake), south Wales, and in the meres of the west Midlands. Lakes change naturally over time, slowly filling in with silt and vegetation and

usually, in the absence of human impact, gradually becoming less fertile. In water bodies which are heavily enriched as a result of human activity, biodiversity is depressed because planktonic and filamentous algae (blanket-weed) increase rapidly at the expense of other aquatic organisms. Sensitive organisms, such as many of the pondweed *Potamogeton* and stonewort *Chara* species, then disappear and water bodies may reach a relatively stable but biologically impoverished state.

Hedgerows

The definition of this priority habitat has been amended from the pre-existing Habitat Action Plan for ancient and/or species rich hedgerows (http://www.ukbap.org.uk/UKPlans.aspx?ID=7).

A hedgerow is defined as any boundary line of trees or shrubs over 20m long and less than 5m wide, and where any gaps between the trees or shrub species are less that 20m wide (Bickmore, 2002). Any bank, wall, ditch or tree within 2m of the centre of the hedgerow is considered to be part of the hedgerow habitat, as is the herbaceous vegetation within 2m of the centre of the hedgerow. All hedgerows consisting predominantly (i.e. 80% or more cover) of at least one woody UK native species are covered by this priority habitat, where each UK country can define the list of woody species native to their respective country. Climbers such as honeysuckle and bramble are recognised as integral to many hedgerows, however they require other woody plants to be present to form a distinct woody boundary feature, as such they are not included in the definition of woody species. The definition is limited to boundary lines of trees or shrubs, and excludes banks or walls without woody shrubs on top of them.

Based on an analysis of Countryside Survey data, using the threshold of at least 80% cover of any UK native woody species, it is estimated that 84% of countryside hedgerows in GB would be included.

Lowland Beech and Yew Woodland

The definition of this habitat remains unchanged from the pre-existing Habitat Action Plan (http://www.ukbap.org.uk/UKPlans.aspx?ID=2) a summary of which appears below.

Lowland beech and yew woodland spans a variety of distinctive vegetation types reflecting differences in soil and topographical conditions. Beech can grow on both acidic and calcareous soils, although its association with yew tends to be most abundant on the calcareous sites. These woods have been managed historically as coppice, coppice with standards, wood-pasture, high forest and minimum intervention. They are often found as intricate mosaics with other woodland communities. The wood-pasture and parkland element is dealt with in another Habitat Action Plan, although some of the issues apply to this plan also. Yew stands on the Carboniferous and Magnesian limestones of central and northern Britain are considered under the upland mixed ashwood plans.

In the United Kingdom beech is considered native only in southern England and southern Wales. Beech would certainly have spread naturally to other areas of the British Isles had forest fragmentation not impeded its progress. This Habitat Action Plan largely considers lowland beech and yew woodlands within their native range, but long-established planted beech woods outside the native range are included where they have acquired a high nature conservation value.

There are no precise data on the total extent of native lowland beech and yew in the UK. In the late 1980s the Nature Conservancy Council estimated the total extent of ancient semi-natural woodland of this type at between 15,000 and 25,000 ha which with recent beech woodland brings the total area to about 30,000 ha. It has declined in area by clearance and replanting with non-native species over the last 50 years.

Calcareous beech and yew woodland forms perhaps 40% of the total amount of lowland beech and yew habitat type defined above. The canopy can include mixtures of beech, ash, sycamore (non-native), yew and whitebeam. Oak is less common than in the other beechwoods, and pure stands of yew occur in places. Promotion of high quality beech for silviculture has often led to an artificial dominance of beech. Characteristic uncommon or rare plants can include box *Buxus sempervirens*, red helleborine *Cephalanthara rubra*, coralroot bitter-cress *Cardamine bulbifera*, and bird`s nest orchid *Neottia nidus-avis*. In some areas, this woodland type occurs as intricate mosaics with lowland mixed deciduous woods. The majority of stands have a high forest structure. This type occurs on the limestone and chalk outcrops in southern Britain *e.g.* chalk scarps of the North and South Downs, the Chilterns and the Cotswolds.

Beech woodland on neutral-slightly acidic soils comprises about 45% of the habitat. It is found on heavier soils (pH 7 to 4) and often where the drainage is poor or impeded. The boundary with the other beech types is often defined by pH, drainage and soil texture; thus it is common to find this type grading into one of the others. Again stands tend to be dominated by beech, but oak *Quercus robur* and sometimes *Q. petrea* is a common associate. Bramble *Rubus fruticosus* forms a characteristic ground layer. Often a shrub layer is lacking, although holly can form a second tier of trees, occasionally with yew. Violet helleborine *Epipactis purpurata* is a rare plant found in this community. Mosaics with oak/ bracken/ bramble woodland are common, and in some areas beech can be found colonising western oakwoods. This type tends to occur as high forest or relict wood-pasture (with pollards), less often abandoned coppice. It is common in (but not confined to) the High and Low Weald, the Chilterns plateau, the New Forest, the Cotswolds and the Wye Valley.

Acidic beech woodland forms the remaining 15% of the habitat type. It usually occurs as high forest but also makes up a large percentage of the lowland wood-pasture sites in England. Acidic beech stands are usually found on light sandy or sometimes gravelly soils that are well drained (pH 3.5 to 4.5). Holly is the main understorey species, less often yew, with oak being the common canopy associate. Mosaics with oak/ birch/ wavy-hair grass communities are not uncommon. The western edge of its range is ill-defined and beech clearance from and spread into western oakwoods occur in almost equal measure. Typical sites are found in the High Weald (on Greensand), Hampshire and London basins, the Chilterns plateau and at a few sites in East Anglia.

The main corresponding National Vegetation Classification (NVC) plant communities associated with this habitat type are W12 *Fagus sylvatica* - *Mercurialis perennis* woodland (base-rich soils), W14 *Fagus sylvatica* - *Rubus fruticosus* woodland (mesotrophic soils), W15 *Fagus sylvatica* - *Deschampsia flexuosa* woodland (acidic soils). Yew stands fall into W13 *Taxus baccata* woodland.

Lowland Calcareous Grassland

The definition of the habitat as given in the pre-existing Habitat Action Plan (http://www.ukbap.org.uk/UKPlans.aspx?ID=12) has been amended to:

- include examples of NVC CG10 *Festuca ovina - Agrostis capillaris - Thymus praecox* grassland where they clearly occur below the upper limits of agricultural enclosure; and
- exclude examples of CG1 *Festuca ovina - Carlina vulgaris* grassland and CG2 *Festuca ovina - Avenula pratensis* grassland where these clearly occur above the upper limits of enclosure.
- In Northern Ireland, enclosed calcareous grassland (mainly CG9 and CG10) is very limited and similar floristically to unenclosed grassland. For practical purposes all calcareous grassland in Northern Ireland is treated as Upland Calcareous Grassland.

Following the 2007 review, occurrences of this habitat on roadside verges are also covered by the definition.

Lowland Dry Acid Grassland

The definition of this habitat remains unchanged from the pre-existing Habitat Action Plan (http://www.ukbap.org.uk/UKPlans.aspx?ID=14) a summary of which appears below. Following the 2007 review, occurrences of this habitat on roadside verges are also covered by the definition.

Lowland acid grassland typically occurs on nutrient-poor, generally free-draining soils with pH ranging from 4 to 5.5 overlying acid rocks or superficial deposits such as sands and gravels. It includes the *Festuca ovina - Agrostis capillaris - Rumex acetosella* (U1), *Deschampsia flexuosa* (U2), *Agrostis curtisii* (U3) and *Festuca ovina - Agrostis capillaris - Galium saxatile* (U4) National Vegetation Classification grassland plant communities. Inland vegetation, but not coastal dunes, characterised by *Carex arenaria* (*Carex arenaria* dune *Festuca ovina* sub-community (SD10b) and *Carex arenaria - Cornicularia aculeata* dune, *Festuca ovina* sub-community (SD11b)) is also included but is highly localised.

Definition of lowland acid grassland is problematical but here it is defined as both enclosed and unenclosed acid grassland throughout the UK lowlands (normally below c. 300m). It covers all acid grassland managed in functional enclosures; swards in old and non-functional enclosures in the upland fringes, which are managed as free-range rough grazing in association with unenclosed tracts of upland, are excluded. It often occurs as an integral part of lowland heath landscapes, in parklands and locally on coastal cliffs and shingle. It is normally managed as pasture.

Acid grassland is characterised by a range of plant species such as heath bedstraw *Galium saxatile*, sheep`s-fescue *Festuca ovina*, common bent *Agrostis capillaris*, sheep`s sorrel *Rumex acetosella,* sand sedge *Carex arenaria*, wavy hair-grass *Deschampsia flexuosa,* bristle bent *Agrostis curtisii* and tormentil *Potentilla erecta,* with presence and abundance depending on community type and locality. Dwarf shrubs such as heather *Calluna vulgaris* and bilberry *Vaccinium myrtillus* can also occur but at low abundance. Lowland acid grassland often forms a mosaic with dwarf shrub heath, the latter being covered in the separate lowland heathland action plan. Acid grasslands can have a high cover of bryophytes and parched acid grassland can be rich in lichens. Acid grassland is very variable in terms of species richness and stands can range from relatively species-poor (less than 5 species per $4m^2$) to species-rich (in excess of 25 species per $4m^2$).

Parched acid grassland in particular contains a significant number of rare and scarce vascular plant species many of which are annuals. These include species such as mossy stonecrop *Crassula tillaea,* smooth rupturewort *Herniaria glabra,* slender bird`s-foot-trefoil *Lotus angustissimus,* bur medick *Medicago minima* and clustered clover *Trifolium glomeratum* and spring speedwell *Veronica verna*. Perennial taxa associated with these grasslands include, sticky catchfly *Lychnis viscaria* and shaggy mouse-ear-hawkweed *Pilosella peleteriana*.

The bird fauna of acid grassland is very similar to that of other lowland dry grasslands which collectively are considered to be a priority habitat for conservation action. Bird species of conservation concern which utilise acid grassland for breeding or wintering include woodlark *Lullula arborea*, stone-curlew *Burhinus oedicnemus*, nightjar *Caprimulgus europaeus*, lapwing *Vanellus vanellus*, skylark *Alauda arvensis*, chough *Pyrrhocorax pyrrhocorax*, green woodpecker *Picus viridis*, hen harrier *Circus cyaneus* and merlin *Falco columbarius*.

Many of the invertebrates that occur in acid grassland are specialist species which do not occur in other types of grassland. The open parched acid grasslands on sandy soils in particular, can support a considerable number of ground-dwelling and burrowing invertebrates such as solitary bees and wasps. A number of rare and scarce species are associated with the habitat, some of which are included on the UK Biodiversity Action Plan list of species of conservation concern, such as the field-cricket *Gryllus campestris*.

As with other lowland semi-natural grassland types, acid grassland has undergone substantial decline in the 20th century although there are no figures available on rates of loss. The decline is mostly due to agricultural intensification although locally, as in the Breckland, afforestation has been significant.

Cover data for lowland acid grassland across the UK for the full altitudinal range are not currently available. Stands remote from the upland fringe, which are the primary focus of conservation attention, are now of restricted occurrence and it is estimated that less than 30,000 ha now remain in UK. Important concentrations occur in the Breckland, the New

Forest, Dorset, Suffolk Sandlings, the Weald, Dungeness, the coasts of SW England and the Welsh and English border hills of Powys and Shropshire. Scotland is estimated to have less than 5000 ha and much of this is likely to be on the upland fringe. Extensive areas of acid grassland are included within sites designated as common land, but separate figures for uplands and lowlands are not available.

It will be important to ensure that acid grasslands are taken into account during implementation of the action plan for lowland heathland; actions in the two plans need to be closely integrated.

Lowland Fens

Formerly named fens, details of this habitat can be found in the pre-existing Habitat Action Plan (http://www.ukbap.org.uk/UKPlans.aspx?ID=18); a summary appears below.

The UK is thought to host a large proportion of the fen surviving in the EU. As in other parts of Europe fen vegetation has declined dramatically in the past century.

Fens are peatlands which 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 bog mosses *Sphagnum* spp. 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.

In intensively farmed lowland areas fens occur less frequently, are smaller in size and more isolated than in other parts of the UK. There are, however, exceptions to this. The UK`s largest continuous area of base-poor fen, the Insh Marshes in the floodplain of the River Spey in Scotland, covers an area of 300 ha, the calcareous rich fen and swamp of Broadland covers an area of 3,000 ha and Lough Erne system in Fermanagh has extensive areas of fen and swamp. In some lowland areas such as the Scottish borders and southern Northern Ireland there are concentrations of small fens of particular importance.

Lowland Heathland

Amended from the pre-existing HAP (http://www.ukbap.org.uk/UKPlans.aspx?ID=15) lowland heathland is described as a broadly open landscape on impoverished, acidic mineral and shallow peat soil, which is characterised by the presence of plants such as heathers and dwarf gorses. It is generally found below 300 metres in altitude in the UK, but in more northerly latitudes the altitudinal limit is often lower. Areas of heathland in good condition should consist of an ericaceous layer of varying heights and structures, plus some or all of the following additional features, depending on environmental and/or management conditions; scattered and clumped trees and scrub; bracken; areas of bare ground; areas of acid grassland; lichens; gorse; wet heaths, bogs and open waters. Lowland heathland can develop on drift soils and weathered flint beds over calcareous soils (limestone or chalk heath). Lowland heathland is a dynamic habitat which undergoes significant changes in different successional stages, from bare ground (e.g. after burning or tree clearing) and grassy stages, to mature, dense heath. These different stages often co-occur on a site. The presence and numbers of characteristic birds, reptiles, invertebrates, vascular plants, bryophytes and lichens are important indicators of habitat quality.

In terms of distinguishing between lowland heathland and genuine acid grassland, less than 25% dwarf shrub cover should be assessed as grassland, over 25% as heathland.

Lowland Meadows

The definition of this habitat remains unchanged from the pre-existing Habitat Action Plan (http://www.ukbap.org.uk/UKPlans.aspx?ID=10) a summary of which appears below. Following the 2007 review, occurrences of this habitat on roadside verges are also covered by the definition.

A wide-ranging approach is adopted in this plan to lowland grasslands treated as lowland meadows. They are taken to include most forms of unimproved neutral grassland across the enclosed lowland landscapes of the UK. In terms of National Vegetation Classification plant communities, they primarily embrace each type of *Cynosurus cristatus - Centaurea nigra* grassland, *Alopecurus pratensis - Sanguisorba officinalis* floodplain meadow and *Cynosurus cristatus - Caltha palustris* flood-pasture. The plan is not restricted to grasslands cut for hay, but also takes into account unimproved neutral pastures where livestock grazing is the main land use. On many farms in different parts of the UK, use of particular fields for grazing pasture and hay cropping changes over time, but the characteristic plant community may persist with subtle changes in floristic composition.

In non-agricultural settings, such grasslands are less frequent but additional examples may be found in recreational sites, church-yards, roadside verges and a variety of other localities. Excluded from this plan are maritime grassland communities confined to coastal habitats (which will be covered in maritime cliff and machair action plans), *Anthoxanthum odoratum - Geranium sylvaticum* grasslands (which are treated in a companion action plan for upland hay meadows) and *Molinia - Juncus* pastures (which are covered in the purple moor grass and rush pasture (*Molinia-Juncus*) plan).

As indicated in the Habitat Statement included in *Biodiversity: the UK Steering Group Report, Vol 2* (1995), unimproved neutral grassland habitat has undergone a remarkable decline in the 20th century, almost entirely due to changing agricultural practice. It is estimated that by 1984 in lowland England and Wales, semi-natural grassland had declined by 97% over the previous 50 years to approximately 0.2 million ha. Losses have continued during the 1980s and 1990s, and have been recorded at 2 -10% per annum in some parts of England. Extensive agricultural modification of unimproved grasslands has also been recorded in Scotland between the 1940s and 1970s. Recent conservation survey findings in Britain and Northern Ireland reveal that the impact has been pervasive, and an estimated extent of less than 15,000 ha of species-rich neutral grassland surviving today in the UK is given in the Habitat Statement.

The plan concentrates on meadows and pastures associated with low-input nutrient regimes, and covers the major forms of neutral grassland which have a specialist group of scarce and declining plant species. Among flowering plants, these include fritillary *Fritillaria meleagris,* Dyer`s greenweed *Genista tinctoria,* green-winged orchid *Orchis morio,* greater butterfly orchid *Platanthera chlorantha,* pepper saxifrage *Silaum silaus* and wood bitter vetch *Vicia orobus*. Lowland meadows and pastures are important habitats for skylark and a number of other farmland birds, notably corncrake which has experienced a major range contraction across the UK.

The overall outcome of habitat change in the lowland agricultural zone is that *Cynosurus - Centaurea* grassland, the mainstream community of unimproved hay meadows and pastures over much of Britain, is now highly localised, fragmented and in small stands. Recent estimates for cover in England and Wales indicate that there is between 5000-10,000 ha of this community in total. There is an especially important concentration in Worcestershire and other particularly important areas include south-west England (Somerset, Dorset and Wiltshire), the East Midlands & East Anglia (Leicestershire, Northamptonshire, Cambridgeshire and Suffolk), in various parts of Wales and in West Fermanagh and Erne Lakeland in Northern Ireland. In certain areas, such as in the old district of Brecknock in Powys, remnant examples are locally aggregated. Scotland is estimated to have between 2000-3000 ha of this community, with particular concentrations in the crofting areas of Lochaber, Skye and the Western Isles. Local data for Northern Ireland are less complete, but the West Fermanagh and Erne Lakeland ESA in NI contains an important concentration of the resource.

Unimproved seasonally-flooded grasslands are less widely distributed. They have lower overall cover, but there are still a few quite large stands. *Alopecurus - Sanguisorba* flood-

meadow has a total cover of <1500 ha and is found in scattered sites from the Thames valley through the Midlands and Welsh borders to the Ouse catchment in Yorkshire. These include well-known but now very rare Lammas meadows, such as North Meadow, Cricklade, and Pixey and Yarnton Meads near Oxford, which are shut up for hay in early spring, cropped in July, with aftermath grazing from early August; nutrients are supplied by flooding episodes in winter. *Cynosurus* - *Caltha* flood-pasture is also now scarce and localised, with probably <1000 ha cover in England and Wales. Scotland is estimated to have 600-800 ha of this community.

It will be important to ensure that such periodically flooded grasslands are taken into account during implementation of the action plan for coastal and floodplain grazing marshes; actions in the two plans need to be closely integrated.

Agricultural intensification has led to the extensive development of nutrient-demanding, productive *Lolium perenne* grasslands. These are managed for grazing and also silage production which has widely replaced traditional hay-making. Where fertiliser input is relaxed or in swards which have only been partially improved, *Lolium* - *Cynosurus* grassland is common; in many respects this is intermediate between improved and unimproved lowland neutral grasslands but has few uncommon species and is generally of low botanical value.

Lowland Mixed Deciduous Woodland

Lowland mixed deciduous woodland includes woodland growing on the full range of soil conditions, from very acidic to base-rich, and takes in most semi-natural woodland in southern and eastern England, and in parts of lowland Wales and Scotland. It thus complements the ranges of upland oak and upland ash types. It occurs largely within enclosed landscapes, usually on sites with well-defined boundaries, at relatively low altitudes, although altitude is not a defining feature. Many are ancient woods and they include the classic examples of ancient woodland studied by Rackham (1980) and Peterken (1981) in East Anglia and the East Midlands. The woods tend to be small, less than 20 ha. Often there is evidence of past coppicing, particularly on moderately acid to base-rich soils; on very acid sands the type may be represented by former wood-pastures of oak and birch.

There is great variety in the species composition of the canopy layer and the ground flora, and this is reflected in the range of associated NVC and Stand Types. *Quercus robur* is generally the commoner oak (although *Quercus petraea* may be abundant locally) and may occur with virtually all combinations of other locally native tree species.

In terms of the National Vegetation Classification the bulk of this type falls into W8 (mainly sub-communities a - c in ancient or recent woods; in the lowlands W8d mostly occurs in secondary woodland) and W10 (sub-communities a to d) with lesser amounts of W16 (mainly W16a). Locally, it may form a mosaic with other types, including patches of beech woodland, small wet areas, and types more commonly found in western Britain. Rides and edges may grade into grassland and scrub types.

The canopy variations as represented by the Stand Type system include most of the field maple (2), lime (4, 5), suckering elm (10) and hornbeam (9) Stand Groups, and substantial proportions of the wych elm (1), ash (3) and oak (6) Stand Groups. More rarely, birch (12) and some alder stands (7C) may also occur. These may require separate management treatments.

There are no precise data on the total extent of lowland mixed deciduous woodland in the UK, but in the late 1980s the Nature Conservancy Council estimated the total extent of this type to be about 250,000ha. There is however no doubt that the area of this priority type on ancient woodland sites has declined in area by clearance, overgrazing and replanting with non-native species, by about 30-40% over the last 50 years.

Open Mosaic Habitats on Previously Developed Land

Correspondence with existing habitat/s

- UK BAP broad habitat: Built up areas and gardens.
- Phase 1: Quarry, Spoil, Mine, Ephemeral/short perennial, Bare Ground.
- NVC: Overall there is a poor fit to described communities and this weakness is identified in the review of coverage of the NVC communities (Rodwell & others 2000). Although some components of the habitat are characterised by annual /open vegetation plant communities described in the NVC (Rodwell & others 2000) others are allied to sclerotic associations better described in continental Europe. Grassland communities associated with this habitat complex include MG1-2, MG9, MG10, MG11, MG13; CG10 (Rodwell & others 1992); and U1-2, whilst the scrub communities W6 and W23 are also commonly encountered (Rodwell & others 1991). Complexes and mosaics can also include a range of aquatic plant communities (see Rodwell & others 1995) and swamp communities (Rodwell & others 1995).
- Annex I: None (Calaminarian grasslands are covered by another priority habitat proposal).
- Other: Poor fit to Shimwell (1983), but includes 3B and artificial-substrate equivalents of 7A
- The priority habitat is delimited by edaphic and other site conditions, and specific sites are likely to include elements of other priority habitats as minor components of the overall mosaic. With the specific exception of post-industrial substrates that are rich in heavy metal which would qualify as the proposed Calaminarian grassland priority habitat, sites with such mosaics will be considered as qualifying as 'open mosaic habitats on previously developed land' priority habitat.

Description

The habitat is best defined in terms of structure and growth forms, rather than through specific vegetation communities. It comprises mosaics of bare ground with, typically, very early pioneer communities on skeletal substrates, more established open grasslands, usually dominated by fine-leaved grasses with many herbs, areas of bare ground, scrub and patches of other habitats such as heathland, swamp, ephemeral pools and inundation grasslands. High quality examples may be characterised as "unmanaged flower-rich grasslands with sparsely-vegetated areas developed over many years on [edaphically-] poor substrates" (Harvey 2000, referring to the East Thames Corridor, but it applies to all types).

These are generally primary successions, and as such unusual in the British landscape, especially the lowlands. The vegetation can have similarities to early/pioneer communities (particularly grasslands) on more 'natural' substrates but, due to the edaphic conditions, the habitat can often persist (remaining relatively stable) for decades without active management (intervention). Stands of vegetation commonly comprise small patches and may vary over relatively small areas, reflecting small-scale variation in substrate and topography.

Plant assemblages are unusual, selected by propagule supply as well as site conditions (Ash, Gemmell and Bradshaw 1994 for several waste types, Shaw 1994 on Pulverized Fuel Ash (PFA)). The habitat supports a range of notable vascular plant, moss and lichen species. These often include species declining in the wider countryside such as *Ophrys apifera*, *Gymnadenia conopsea* (alkaline wastes), *Epipactis youngiana* (acid waste), *Osmunda regalis* (acid sandstone quarries), *Peltigera rufescens* (lime waste, PFA), *Cladonia pocillum* (calcareous wastes), *Diploschistes muscorum* (PFA) and a UK BAP priority liverwort, *Petalophyllum ralfsii* (PFA). Exotic plant species, which are well adapted to the prevailing environmental conditions, are a characteristic component of associated plant assemblages.

Invertebrate faunas can be species-rich and include many uncommon species (Eyre and others*.,* 2002, 2004). Between 12 and 15% of all nationally-rare and nationally-scarce insects are recorded from brownfield sites, which will include many post-industrial examples (Gibson 1998; Jones 2002) (see below). Exotic plants provide for an extended flowering season and,

with the floristic and structural diversity of the habitat mosaic, contribute to the value of the habitat for invertebrates (see Bodsworth and others, 2005).

Some areas are important for birds that are primarily associated with previously developed or brownfield land such as little ringed plover (in 1984 97% of LRP nests in England were in 'man-made' habitats), as well as more widespread, but UK BAP priority species, including skylark and grey partridge. The habitat provides secure breeding and feeding areas commonly absent from land under agricultural management.

The heterogeneity within the habitat mosaic reflects chemical and physical modification by former development or previous industrial processes, including the exposure of underlying substrates and the tipping of wastes and spoils. Features such as ditches, other exposures, spoil mounds and even the relicts of built structures provide topographical heterogeneity at the macro and micro scale. Sealed surfaces and compaction add further variation and contribute to the modified hydrology of such habitats resulting in areas of impeded and accelerated drainage. Stochastic factors also have a significant influence in shaping the habitat.

Edaphic conditions for this habitat are severely limiting on plant growth. Examples are substrates with extreme pH, whether alkaline (e.g., chemical wastes) or acid (e.g., colliery spoils); deficiency of nitrogen (PFA), or available phosphate (highly calcareous Leblanc waste, blast furnace slag and calcareous quarry spoil); or water-deficient (dry gravel and sand pits). Other typical situations where such conditions arise include disused quarries, former railway sidings, extraction pits and landfill sites.

The main criteria for selection of qualifying habitats of high nature conservation value are:

- Rich and/or large examples of habitats typical of the substrate/edaphic conditions concerned, which demonstrate the characteristic mosaic of bare ground, pioneer communities, flower rich grassland and other habitat patches with associated structural and topographical features.
- Areas that have retained bare ground and pioneer communities over an extended period, demonstrating arrested succession;
- Threatened areas that support either the last remaining examples where the habitat was formerly widespread/extensive, or rare/ specialised types of this habitat for example where the nature of the substrate is particularly unusual
- Presence of UK BAP priority species or Red Data Book/List species;
- Importance for an exceptional assemblage of key species groups.

The habitat is concentrated in urban, urban fringe and large-scale former industrial landscapes, especially in the lowlands, though more isolated examples can be found on previously developed land in more remote rural areas. Although there are inventories of previously developed land the habitat has not been mapped consistently at a UK level. A Defra research proposal (title - *Definition & mapping of open mosaic habitats on previously developed land*) will further quantify and refine the definitions as well as mapping much of the habitat. It is expected to report in 2009.

Ponds

Correspondence with existing habitat/s

- UK BAP broad habitat: Standing open waters and canals
- Phase 1: G1 Standing water
- NVC: Various aquatic, swamp and fen communities; OV28-OV35; and others
- Annex I: Includes H3170 Mediterranean temporary ponds; H3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflora*) (part); H3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoeto-Nanojuncetea* (part); H3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. (part); H3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation (part); and H3160 Natural dystrophic lakes and ponds (part)

Description

Ponds, for the purpose of UK BAP priority habitat classification, are defined as permanent and seasonal standing water bodies up to 2 ha in extent which meet one or more of the following criteria:

- Habitats of international importance: Ponds that meet criteria under Annex I of the Habitats Directive.
- Species of high conservation importance: Ponds supporting Red Data Book species, UK BAP species, species fully protected under the Wildlife and Countryside Act Schedule 5 and 8, Habitats Directive Annex II species, a Nationally Scarce wetland plant species, or three Nationally Scarce aquatic invertebrate species.
- Exceptional assemblages of key biotic groups: Ponds supporting exceptional populations or numbers of key species. Based on (i) criteria specified in guidelines for the selection of biological SSSIs (currently amphibians and dragonflies only), and (ii) exceptionally rich sites for plants or invertebrates (i.e. supporting ≥30 wetland plant species or ≥50 aquatic macroinvertebrate species).
- Ponds of high ecological quality: Ponds classified in the top PSYM category ("high") for ecological quality (i.e. having a PSYM score ≥75%). [PSYM (the Predictive SYstem for Multimetrics) is a method for assessing the biological quality of still waters in England and Wales; plant species and / or invertebrate families are surveyed using a standard method; the PSYM model makes predictions for the site based on environmental data and using a minimally impaired pond dataset; comparison of the prediction and observed data gives a % score for ponds quality].
- Other important ponds: Individual ponds or groups of ponds with a limited geographic distribution recognised as important because of their age, rarity of type or landscape context e.g. pingos, duneslack ponds, machair ponds.

Priority habitat ponds can be readily identified by standard survey techniques such as those developed for NVC, Common Standards Monitoring, the National Pond Survey or for specific species groups. Ponds will need to be distinguished from other existing priority habitat types. The general principle to be applied is that where the standing water element is functionally a component of another priority habitat and that priority habitat definition takes account of the standing water element then it should be treated as part of that habitat. For example small waterbodies within blanket bog should be considered as part of the blanket bog priority habitat, but ponds in heathland (which are not dealt with through the heathland HAP) should be considered under the pond priority habitat. Agreement has been reached with the lake HAP group that the pond priority habitat will cover most water bodies up to 2 ha while the lake priority habitat will cover most water bodies greater than 2ha. As with other potentially overlapping priority habitat types a small proportion of cases will need to be individually assessed to decide how they are best dealt with.

Ponds are widespread throughout the UK, but high-quality examples are now highly localised, especially in the lowlands. In certain areas high quality ponds form particularly significant elements of the landscape, e.g. Cheshire Plan marl pits, the New Forest ponds, pingos of

East Anglia, mid-Wales mawn pools, the North East Wales pond landscape, the forest and moorland pools of Speyside, dune slack pools, the machair pools in the Western Isles of Scotland, and examples of Habitats Directive Annex I pond habitats across Northern Ireland.

Estimates, based on the relatively small pond data sets currently available, suggest that around 20% of the c.400,000 ponds outside curtilage in the UK might meet one or more of the above criteria.

An inventory of ponds, including many high quality sites, has been established as part of the National Pond Monitoring Network and work is in progress to add further known sites to this database. This is publicly accessible (for non-sensitive sites/species) at www.pondnetwork.org.uk. Currently about 500 high quality sites are listed on this database. The National Pond Monitoring Network (NPMN) will provide the main mechanism for monitoring priority habitat ponds. The NPMN was established in 2002 as a partnership of organisations involved in pond monitoring led by the Environment Agency and Pond Conservation.

Reedbeds

The definition of this habitat remains unchanged from the pre-existing Habitat Action Plan (http://www.ukbap.org.uk/UKPlans.aspx?ID=19) a summary of which appears below.

Reedbeds are wetlands dominated by stands of the common reed *Phragmites australis*, wherein the water table is at or above ground level for most of the year. They tend to incorporate areas of open water and ditches, and small areas of wet grassland and carr woodland may be associated with them.

There are about 5000 ha of reedbeds 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 amongst the most important habitats for birds in the UK. They support a distinctive breeding bird assemblage including 6 nationally rare Red Data Birds the bittern *Botaurus stellaris*, marsh harrier, *Circus aeruginosus*, crane *Grus grus*, Cetti`s warbler *Cettia cetti*, Savi`s warbler *Locustella luscinioides* and bearded tit *Panurus biarmicus,* provide roosting and feeding sites for migratory species (including the globally threatened aquatic warbler *Acrocephalus paludicola*) and are used as roost sites for several raptor species in winter. Five GB Red Data Book invertebrates are also closely associated with reedbeds including red leopard moth *Phragmataecia castanaea* and a rove beetle *Lathrobium rufipenne*.

Rivers

Correspondence with existing habitat/s

- UK BAP broad habitat: Rivers and streams
- Phase 1: G2 Running water
- NVC: Various, including A2, A8-9, A11-20, S4-9, S11-14, S16-19, S22 and others
- Annex I: H3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- JNCC river types: I-X

Description

This habitat type includes a very wide range of types, encompassing all natural and near-natural running waters in the UK (i.e. with features and processes that resemble those in 'natural' systems). These range from torrential mountain streams to meandering lowland rivers.

Numerous factors influence the ecological characteristics of a watercourse, for example geology, topography, substrate, gradient, flow rate, altitude, channel profile, climate, catchment features (soil, land use, vegetation etc). Human activities add to this complexity. In addition most river systems change greatly in character as they flow from source to sea or lake. Although various classifications and typologies for rivers exist, none is considered adequate for identifying a discrete but comprehensive series of specific priority types against the criteria. Consequently a broad 'rivers' priority habitat has been adopted by the UK BAP, which includes the existing priority habitat, chalk rivers. Work to refine the criteria to identify the priority habitat and to map relevant features is on-going in 2008.

The draft criteria are:

Qualifying Features

1. Headwaters (see below for more details)
2. Occurrence of the EU Habitat Directive Annex I habitat (H3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation). The definition will include (but not be confined to) all river SACs designated for the feature. (see below for more details)
3. Chalk Rivers as given in the existing BAP definition. (see below for more details)
4. Active shingle rivers. (see below for more details)
5. A/SSSI (Areas or Sites of Special Scientific Interest):
   a. A/SSSI designated for river species, riverine features or fluvial geomorphology
   b. Rivers designated for other features (e.g. surrounding wetlands), with the exception of severely degraded reaches (see below)
6. Sites identified for fluvial geomorphology through the Geological Conservation Review (GCR) and the Earth Science Conservation Review (ESCR - Northern Ireland)
7. Species – detailed quantitative guidance is under development in 2008 and will cover:
   a. Occurrence of Annex II Habitats Directive species
   b. BAP priority species
8. Riverine water bodies of high hydromorphological/ecological status. The Environment Agency and the Scottish Environmental Protection Agency are working on criteria and rules to identify such water bodies, which will be added to the UK BAP criteria when they are available.

Disqualifying feature

9. Reaches which are heavily degraded and which have little scope for improvement, for example because they are heavily canalised, will not be considered for inclusion as BAP priority habitat.

The principal units for identifying priority river habitats will be Evaluated Corridor Sections (ECSs) as defined in SERCON (System for Evaluating Rivers for Conservation Boon and

others 1996). An ECS is a stretch of river (or 'reach'), normally 10-30 km, which has reasonably homogeneous physical characteristics in terms of geology, slope, etc. In 2007, Environment Agency and Scottish Natural Heritage ran a joint project to divide the major UK rivers into ECSs. The upstream and downstream grid references for these ECSs will be available.

The following are excluded from this priority habitat:

- Canals
- Ditches

As a minimum the rivers priority habitat would be defined as extending to the top of the adjacent banks, recognising that (a) it may be desirable to restore a river to a previous course, and (b) a river's floodplain (present or historical) may be essential to its ecological functioning. Significant areas of adjoining priority habitats (such as fen, woodland, grassland and heathland types) may form an integral component of river systems for the purposes of conservation and management, but would be excluded from the formal definition of the Rivers priority habitat. This would also apply to areas of metalliferous river shingle supporting Calaminarian grassland (part of a separate proposed priority habitat). Adjacent ponds would be included within the River habitat if they have been formed as a result of river dynamics (e.g. oxbows), but not if they are artificial or formed by an unrelated process (e.g. pingos).

The plant and animal assemblages of rivers and streams vary according to their geographical area, underlying geology and water quality. Swiftly-flowing upland, nutrient-poor rivers support a wide range of mosses and liverworts and relatively few species of higher plants. The invertebrate fauna of upland rivers is dominated by stoneflies, mayflies and caddisflies, while fish such as salmon *Salmo salar* and brown trout *Salmo trutta* will almost certainly be present. In contrast, lowland nutrient-rich systems are dominated by higher plants, and coarse fish such as chub *Leuciscus cephalus*, dace *Leuciscus leuciscus* and roach *Rutilus rutilus*. Exposed sediments such as shingle beds and sand bars are important for a range of invertebrates, notably ground beetles, spiders and craneflies. Marginal and bankside vegetation is an integral part of a river, supporting a range of river processes, as well as acting as habitat in its own right for a diverse flora and fauna, and as a migration corridor.

Further Detail of the criteria

Chalk Rivers

Extracted from the *UK HAP for chalk rivers* (http://www.ukbap.org.uk/UKPlans.aspx?ID=25). Further, updated information is given in *The state of England's chalk rivers* (2004).

There are approximately 35 chalk rivers and major tributaries ranging from 20 to 90 kilometres in length. They are located in south and east England - from the Frome in Dorset to the Hull in Humberside.

Chalk rivers have a characteristic plant community, often dominated in mid-channel by river water crowfoot *Ranunculus penicillatus* var. *pseudofluitans* and starworts *Callitriche obtusangula* and *C. platycarpa*, and along the edges by watercress *Rorippa nasturtium-aquaticum* and lesser water-parsnip *Berula erecta*. They have low banks which support a range of water-loving plants. This plan considers action required for the river channel and banks but not for the whole catchment or floodplain.

All chalk rivers are fed from groundwater aquifers, producing clear waters and a generally stable flow and temperature regime. These are conditions which support a rich diversity of invertebrate life and important game fisheries, notably for brown trout *Salmo trutta*, brook lamprey *Lampetra planeri*, salmon *Salmo salar*, crayfish *Austropotamobius pallipes* and otter *Lutra lutra* are among the species listed on Annex II of the EC Habitats Directive which chalk rivers support.

Most chalk rivers have 'winterbourne' stretches in their headwaters. These often run dry, or partially dry, in late summer because of lack of rainfall recharging the aquifer. A characteristic range of invertebrates has adapted to these conditions, as is the brook water crowfoot *Ranunculus peltatus*.

Where the river corridor (approximately 50m either side of the river) is not affected by intensive agriculture, fisheries or urban development, rich fen vegetation has developed. This

is maintained by extensive cattle grazing or naturally progresses to carr woodland. These areas are particularly rich in insect life and breeding birds.

Rivers with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

Extracted from *McLeod* and others *(2005) Selection of SACs in the UK: habitat accounts;* see: http://www.jncc.gov.uk/ProtectedSites/ SACselection/habitat.asp?FeatureIntCode=H3260. A fuller description and classification of this habitat type in the UK, together with details of threats and impacts, are given in Hatton-Ellis and others (2003) Ecology of watercourses characterised by *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. Conserving Natura 2000 Rivers Ecology Series No. 11. English Nature, Peterborough.

This habitat type is characterised by the abundance of water-crowfoots *Ranunculus* spp., subgenus *Batrachium* (*Ranunculus fluitans*, *R. penicillatus* sap. *penicillatus*, *R. penicillatus* sap. *pseudofluitans*, and *R. peltatus* and its hybrids). Floating mats of these white-flowered species are characteristic of river channels in early to mid-summer. They may modify water flow, promote fine sediment deposition, and provide shelter and food for fish and invertebrate animals.

There are several variants of this habitat in the UK, depending on geology and river type. In each, *Ranunculus* species are associated with a different assemblage of other aquatic plants [but see sub-type 3], such as water-cress *Rorippa nasturtium-aquaticum*, water-starworts *Callitriche* spp., water-parsnips *Sium latifolium* and *Berula erecta*, water-milfoils *Myriophyllum* spp. and water forget-me-not *Myosotis scorpioides*. In some rivers, the cover of these species may exceed that of *Ranunculus* species. Three main sub-types are defined by substrate and the dominant species within the *Ranunculus* community.

Sub-type 1: This variant is found on rivers on chalk substrates. The community is characterised by pond water-crowfoot *Ranunculus peltatus* in spring-fed headwater streams (winterbournes), stream water-crowfoot *R. penicillatus* sap. *pseudofluitans* in the middle reaches, and river water-crowfoot *R. fluitans* in the downstream sections. *Ranunculus* is typically associated in the upper and middle reaches with *Callitriche obtusangula* and *C. platycarpa*.

Sub-type 2: This variant is found on other substrates, ranging from lime-rich substrates such as oolite, through soft sandstone and clay to more mesotrophic and oligotrophic rocks. There is considerable geographic and ecological variation in this sub-type. Faster-flowing western rivers on harder rocks, for example in Wales and south-west England, support stream water-crowfoot *Ranunculus penicillatus* sap. *penicillatus*, while western and northern rivers on sandstone or alluvial substrates often support both *R. penicillatus* sap. *penicillatus* and river water-crowfoot *R. fluitans.* Sub-type 2 rivers elsewhere in the UK contain a mixture of species, and often hybrids, but rarely support *R. penicillatus* sap. *penicillatus* or *R. fluitans*. Associated species which may be present include lesser water-parsnip *Berula erecta*, blunt-fruited water-starwort *Callitriche obtusangula*, and, in more polluted rivers, curled pondweed *Potamogeton crispus*, fennel pondweed *P. pectinatus* and horned pondweed *Zannichellia palustris*. Flowering-rush *Butomus umbellatus* is an occasional bank-side associate.

Sub-type 3: This variant is a mesotrophic to oligotrophic community found on hard rocks in the north and west. Rivers in Wales, Northern Ireland and south-west England are significant for the occurrence of stream water-crowfoot *Ranunculus penicillatus* sap. *penicillatus*. Other typical species include the aquatic moss *Fontinalis squamosa*, alternate water-milfoil *Myriophyllum alterniflorum* and intermediate water-starwort *Callitriche hamulata*. More oligotrophic examples of this community lack *Ranunculus* spp. and are dominated by *M. alterniflorum*, *C. hamulata* and bog pondweed *Potamogeton polygonifolius*.

Headwaters

Based on submission to priority habitats review dated 2/11/05

The definition of 'headwater' as given by Furse (1995) is 'a watercourse within 2.5 km of its furthest source as marked with a blue line on Ordnance Survey (OS) Landranger maps with a scale of 1:50,000.' In Britain, headwaters probably represent >70% of the total length of flowing waters. This implies a total length >146,000 km.

Physical and chemical characteristics of headwaters vary greatly according to their location, altitude, geology, and surrounding land-use. By definition, headwaters form the uppermost

segments of rivers, and as such play an important role in the overall functioning of river ecosystems downstream. Although some headwaters, either deliberately or incidentally, are included within protected areas such as SACs and SSSIs/ASSIs most are not, and the total length of headwaters receiving some form of special protection is a very small percentage of all headwaters in the UK.

Active Shingle Rivers

Based on submission to priority habitats review dated 2/11/05

This habitat comprises those rivers which have significant reaches composed of a gravel or pebble bed material (with grain sizes in the range 2-256 mm), sometimes with discrete sandy reaches or deposits (0.064-2 mm diameter) in areas of lower slope, and having characteristic suites of features generated by the processes of erosion, sediment transport, deposition, and storage. Their headwaters are usually in upland areas which generate high-energy discharges, resulting in intermittent sediment movement. Average bed sediment size usually declines downstream (with the downstream reduction in underlying gradient and stream power) generating a commensurate change in habitat.

Typically, these rivers have extensive reaches of gravel, pebble and sand bed material in their middle reaches and in the piedmont zone, these shingle deposits being associated with a wandering, dynamic, meandering or divided channel and active erosion and sediment deposition features. The gravel-bed reaches exhibit characteristic macro-scale bed form morphology with features including point bars and eroding cliffs, side- and mid-channel bars, and pool–riffle sequences. These features are typically unvegetated, reflecting their dynamic nature. Sediment transport and the formation of the characteristic habitat features typically occur only at high flows, when bedload may comprise up to 50% of the total sediment load in transit. Many of the macro-scale features are exposed in the channel as shingle during low-flow conditions. Sand bed reaches or deposits typically exhibit micro-scale bed form morphology with features such as ripples, dunes and plane beds. The transport and deposition of sand-sized material occurs across a wide range of discharges.

Traditional Orchards

Correspondence with existing habitat/s

- UK BAP broad habitat*:* Broadleaved, mixed and yew woodland (the proposed habitat is a habitat complex like lowland wood-pasture and parkland, which is in this broad habitat)
- Phase 1: A. Woodland and scrub, A 1.1.2. Broadleaved plantation, orchard, to be identified by existing/added symbols (England Field Unit 1990).
- NVC: Incorporates several types as part of the orchard habitat complex e.g. MG5, MG6, W24.
- Annex I: Incorporates parts of several Annex I types, for example lowland calcareous grassland in some sites within the Annex I type H6210 semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*).

Description

Habitat structure rather than vegetation type, topography or soils, is the defining feature of the habitat. Traditional orchards are structurally and ecologically similar to wood-pasture and parkland, with open-grown trees set in herbaceous vegetation, but are generally distinguished from these priority habitat complexes by the following characteristics: the species composition of the trees, these being primarily in the family Rosaceae; the usually denser arrangement of the trees; the small scale of individual habitat patches; the wider dispersion and greater frequency of occurrence of habitat patches in the countryside. Traditional orchards include plantings for nuts, principally hazel nuts, but also walnuts.

Management of the trees is the other main feature distinguishing traditional orchards and wood-pasture and parkland. Trees in traditional orchards are, or were, grown for fruit and nut production, usually achieved through activities such as grafting and pruning, whereas timber has been the main product from trees in wood-pastures and parkland, mostly derived from pollarding or selective felling. Grazing or cutting of herbaceous vegetation are integral to orchard management, as they are in wood-pastures and parkland. The presence of scrub, mostly the form of hedgerows on the site boundaries, or sometimes, especially in unmanaged orchards, among the orchard trees, is analogous to the frequent occurrence of scrub in wood pastures and parkland and plays a similar ecological role (see under biodiversity characteristics described below). Ponds and other wetland features are often present, being used now, or in the past, for watering livestock.

Orchards are hotspots for biodiversity in the countryside, supporting a wide range of wildlife and containing UK BAP priority habitats and species, as well as an array of Nationally Rare and Nationally Scarce species. The wildlife of orchard sites depends on the mosaic of habitats they encompass, including fruit trees, scrub, hedgerows, hedgerow trees, non-fruit trees within the orchard, the orchard floor habitats, fallen dead wood and associated features such as ponds and streams. A feature of the biodiversity of traditional orchards is the great variety of fruit cultivars that they contain, for example Luckwill and Pollard (1963) list 101 varieties of perry pear distributed across the parishes of Gloucestershire. This agricultural biological diversity is not an explicit part of the current UK BAP, although the UK Government is a signatory to the Global Strategy for Plant Conservation 2001. The Government response (Cheffings and others 2004) includes a target for conserving crop diversity.

Traditional orchards are defined for priority habitat purposes as orchards managed in a low intensity way, in contrast with orchards managed intensively for fruit production by the input of chemicals such as pesticides and inorganic fertilisers, frequent mowing of the orchard floor rather than grazing or cutting for hay, and planting of short-lived, high-density, dwarf or bush fruit trees. Spacing of trees in traditional orchard can vary quite widely (from c.3 m in some plum orchards and traditional cobnut plats to over 20 m in some large perry pear and cherry orchards. There is some overlap of density of planting with intensive orchards, but these orchards often have densities at least twice the density of the most closely-spaced traditional orchard.

Like wood-pastures and parklands, traditional orchards can occur on a wide range of soil types from slightly acid, relatively infertile soils to fertile river floodplain soils and lime-rich

soils. Orchards can be found on slopes ranging from steep to level, and with any aspect. Generally, sites do not have badly impeded drainage, although locally, within sites, there may be wetter areas. Orchards are found in the lowland landscape in the UK, defined as the land below the altitudinal limit of enclosure (i.e. below the 'moor wall').

Traditional orchards are found in all countries of the UK although England has the bulk of the resource. Areas digitally mapped by the Ordnance Survey have been found to provide a relatively accurate estimate of total orchard area, through testing by ground-truthing and aerial photograph interpretation (English Nature in prep). Together with country information on extent of commercial orchards in agricultural census returns, digital Master Map polygons can be used to make initial estimates of the extent of the resource (see table below).

The estimated extent of traditional orchards in the UK (28,750ha), puts the habitat at the rarer end of the scale compared to existing priority habitats. These range from Upland hay meadows 1,100ha, Lowland wood-pasture and parkland 35,000ha, Lowland heathland over 60,000ha, Upland oakwood 85,000 ha to Upland heath 2,109,400ha).

Table: Estimated extent of traditional orchards in UK

Country	*Orchard area (ha)	**Traditional orchard area (ha)
England	47,000	28,000
Scotland	290	250
Wales	840	440
Northern Ireland	(1600)	60

*Ordnance Survey area except in Northern Ireland where area under fruit (top and soft) is given from the agricultural census 2004.

** England = Ordnance Survey area minus area of commercial orchards in census of 2000 defined as intensive (84%) by lack of fully grassed orchard floor (Central Science Laboratory data). Scotland and Wales = Ordnance Survey area minus area of commercial orchards in agricultural censuses of 2003 and 2002 respectively. Note that some of the commercial orchards in Scotland and Wales may be traditional orchards, thus the estimate of traditional orchard area may be an underestimate. Northern Ireland estimate from figure given in the Environmentally Sensitive Areas scheme booklet, traditional orchards option.

The Ordnance Survey data, which do not distinguish traditional and intensive orchards, show that orchards are dispersed throughout the lowlands of Britain (see Map 2), though there are concentrations in some areas particularly Kent, Cambridgeshire, Somerset and the Three Counties of Herefordshire, Worcestershire and Gloucestershire. The bulk (78%) of the commercial fruit production occurs in these concentrations in England, which implies that traditional orchards comprise the majority of the orchards elsewhere, as well as being known to occur in the orchard concentration areas.

Traditional orchards can easily be distinguished from other wooded habitats based on the preponderance of domestic fruit and nut species: apple, plum, pear, damson, cherry, walnut and cobnut. Only in a very few cases will there be a significant number of other tree species in a traditional orchard, unless the orchard is becoming woodland through neglect. An arbitrary distinction of, say, 50% of trees should be domestic fruit or nut species in an orchard, is rarely likely to be invoked for distinguishing orchards from wood-pasture/parkland.

Map 2: Orchard distribution in England, Scotland and Wales. Reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationary Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceeding. English Nature 100017954 [2005].

A simple mappable definition is under discussion in 2008 and may be based on the rules adopted for the Natural England orchard project which refer to the distance between crown edges and number of trees (for this project, crown edges of trees must be within 20m of each other to be included in the orchard patch, and there must be more than 5 trees within 20m of each other's crown edges).

Traditional orchards, as distinct from non-traditional orchards are defined for priority habitat purposes as orchards managed in a low intensity way. They contrast with orchards managed intensively for fruit production, where there are inputs of chemicals such as pesticides and inorganic fertilisers, frequent mowing of the orchard floor rather than grazing or cutting for

hay, and planting of short-lived, high-density, dwarf or bush fruit trees (stems generally 75 cms or less). The simplest visual indicator of intensive management is the presence of herbicided strips along the tree rows, where the ground is generally bare or with some annual plant regrowth, contrasting with the permanent grassland of the between-row spaces. Such strips are readily observable on aerial photographs. According to orchard pesticide usage surveys by the Central Science Laboratory, use of herbicide is associated with other pesticide use and intensive mowing between tree-rows, while in contrast, orchards with fully grassed floors can be considered traditional (Dr Joe Crocker, CSL, pers comm.). There may potentially be cases where other pesticides or inorganic fertilisers or other intensive management practices are used without herbicide. As a consequence, there may be occasionally instances for limited ground-truthing, for instance, where herbicide strips are not evident but the trees appear small and closely-spaced, by checking density / spacing (see below) and stature of trees on the ground. Spacing of trees in traditional orchard can vary quite widely from around 3 m to over 20 m between trees (see above). There is some overlap of density of planting with intensive orchards, so a density distinction is not useful on its own. However, non-traditional orchards often have densities at least twice the density of the most closely-spaced traditional orchard, and density/planting distance (< 3m in many intensive orchards) can help in the distinction of intensive orchards as described above.

Wet Woodland

The definition of this habitat remains unchanged from the pre-existing Habitat Action Plan (http://www.ukbap.org.uk/UKPlans.aspx?ID=4) a summary of which appears below.

Wet woodland occurs on poorly drained or seasonally wet soils, usually with alder, birch and willows as the predominant tree species, but sometimes including ash, oak, pine and beech on the drier riparian areas. It is found on floodplains, as successional habitat on fens, mires and bogs, along streams and hill-side flushes, and in peaty hollows. These woodlands occur on a range of soil types including nutrient-rich mineral and acid, nutrient-poor organic ones. The boundaries with dryland woodland may be sharp or gradual and may (but not always) change with time through succession, depending on the hydrological conditions and the treatment of the wood and its surrounding land. Therefore wet woods frequently occur in mosaic with other woodland key habitat types (e.g. with upland mixed ash or oakwoods) and with open key habitats such as fens. Management of individual sites needs to consider both sets of requirements.

In terms of National Vegetation Classification (NVC) plant communities this habitat is characterised by W1 *Salix cinerea - Galium palustre* woodland, W2 *Salix cinerea - Betula pubescens - Phragmites australis* woodland, W3 *Salix pentandra - Carex rostrata* woodland, W4c *Betula pubescens - Molinia caerulea* woodland: *Sphagnum* sub-community, W5 *Alnus glutinosa - Carex paniculata* woodland, W6 *Alnus glutinosa - Urtica dioica* woodland, and W7 *Alnus glutinosa - Fraxinus excelsior - Lysimachia nemorum* woodland. Some birch stands classified as W4 are relatively dry and in management terms better treated alongside other extensive birch stands. As a provisional division, sub-communities W4a and W4b are better associated with Upland/Northern Birchwoods. Just as small wet woodland patches may be treated as part of a dry land mosaic, so dry land fringes of predominantly wet woodland areas are linked with the accompanying wet woodland. Wet flood plain forests of ash, elm and oak, lacking alder, are most likely to fall into W8 *Fraxinus excelsior- Acer campestre - Mercurialis perennis* woodland.

Many alder woods are ancient and have a long history of coppice management which has determined their structure, and in some situations it appears that this practice has maintained alder as the dominant species and impeded succession to drier woodland communities. Other wet woodland may have developed through natural succession on open wetlands (sometimes following cessation of active management) and structurally are little influenced by direct forestry treatments.

Notable concentrations of wet woodland on fens occur in East Anglia, Shropshire and Cheshire, while hill-side and plateau alder woods are more restricted to Wales, Cumbria and western Scotland. Fragments of ancient floodplain forest are rare, and the best examples are probably in the New Forest and northern Scotland. Bog woodlands of pine on bog are confined to Scotland, but fragments of birch bog woodland occur more widely in scattered stands across the UK.

Some wet woods include habitats identified under Annex 1 of the EC Habitats Directive, for example Residual alluvial forests and Bog Woodland.

There are no precise data on the total extent of wet woodland in the UK, but in the late 1980s the Nature Conservancy Council estimated the total extent of this type in ancient semi-natural woodland to be about 25,000 - 30,000 ha. The area of recent wet woodland may be at least as large again. Thus a crude estimate of the total wet woodland area in the UK is 50,000 - 70,000 ha.

Wet woodland combines elements of many other ecosystems and as such is important for many taxa. The high humidity favours bryophyte growth. The number of invertebrates associated with alder, birch and willows, is very large, although some are now confined to just a few sites, for example the biodiversity priority species beetles *Melanopion minimun* and *Rhynchaenus testaceus*. Even quite small seepages may support craneflies such as *Lipsothrix errans* and the endemic *Lipsothrix nervosa*. Dead wood within the sites can be frequent, and its association with water provides specialised habitats not found in dry woodland types - the fly *Lipsothrix nigristigma* for example is associated with log jams in streams. Wet woodland provides cover and breeding sites for otters *Lutra lutra*. While few rare plant species depend on wet woodland *per se*, there may be relict species from the former open wetlands on the site such as the marsh fern *Thelypteris palustris*.

Wood-Pasture and Parkland

Amended from the pre-existing Habitat Action Plan for lowland wood-pasture and parkland (http://www.ukbap.org.uk/UKPlans.aspx?ID=5). Wood-pastures are described as areas that have been managed by a long-established tradition of grazing allowing, where the site is in good condition, the survival of multiple generations of trees, characteristically with at least some veteran trees or shrubs. The tree and shrub component may have been exploited in the past and can occur as scattered individuals, small groups, or as more or less complete canopy cover. Depending on the degree of canopy cover other semi-natural habitats, including grassland, heath, scrub etc. may occur in mosaic with woodland communities. While oak, beech, alder, birch, ash, hawthorn, hazel or pine are often dominant, a wide range of other tree and shrub species may occur as part of wood-pasture systems.

Wood-pastures and parkland are the products of historic land management systems, and represent a vegetation structure rather than being a particular plant community. Typically this structure consists of large, open-grown or high forest trees (often pollards) at various densities, in a matrix of grazed grassland, heathland and/or woodland floras.

In terms of the National Vegetation Classification (NVC) of plant communities lowland wood-pastures and parkland are most commonly associated with W10 *Quercus robur* - *Pteridium aquilinum* – *Rubus fruticosus* woodland, W14 *Fagus sylvatica* - *Rubus fruticosus* woodland, W15 *Fagus sylvatica* - *Deschampsia flexuosa* woodland and W16 *Quercus* spp. - *Betula* spp.- *Deschampsia flexuosa* woodland, although others may occur. Upland examples may show more resemblance to W11 and W17 woodland types. In addition the more open wood-pastures and parkland may include various scrub, heathland, improved and unimproved grassland NVC communities.

There are no reliable statistics on the extent of the overall resource, nor on historical and current rates of loss or degradation of this type of habitat. The figure of 10-20,000 ha currently in a working condition given in the habitat statement of the UK Biodiversity Steering Group report is the current best estimate. This habitat is most common in southern Britain, but scattered examples occur throughout the country for example Hamilton High Parks and Dalkeith Oakwood in Scotland. Recently it has been recognised as also being widespread formerly in the uplands. Outgrown wood-pasture and mature high forest remnants (virgin forests) occur in northern and central Europe, but the number and continuity of ancient (veteran) trees with their associated distinctive saproxylic (wood-eating) fauna and epiphytic flora are more abundant in Britain than elsewhere. Parklands and wood-pasture may also be of interest for bats and birds and may preserve indigenous tree genotypes. These areas are outstanding at a European level.

These sites are frequently of national historic, cultural and landscape importance, for example in the New Forest. Some, but not all, of the individual habitat components (lowland beech and yew woodland, lowland heathland, lowland dry acid grassland) are biodiversity action plan priority habitats in their own right. Requirements of these plans will need to be given due regard during implementation.

Included in this plan are:

- Wood-pastures and parklands derived from medieval forests and emparkments, wooded commons, parks and pastures with trees in them. Some have subsequently had a designed landscape superimposed in the 16th to 19th centuries. A range of native species usually predominates amongst the old trees but there may be non-native species which have been planted or regenerated naturally.
- Parklands with their origins in the 19th century or later where they contain much older trees derived from an earlier landscape.
- Under-managed and unmanaged wood-pastures with veteran trees, in a matrix of secondary woodland or scrub that has developed by regeneration and/or planting.
- Parkland or wood-pasture that has been converted to other land uses such as arable fields, forestry and amenity land, but where surviving veteran trees are of nature conservation interest. Some of the characteristic wood-pasture and parkland species may have survived this change in state.

Not normally included in this plan are:

- Upland sheep-grazed closed-canopy oak woodland, derived from coppice, or Caledonian pine forest (see the respective plans for these habitats), although in some cases grazing may be part of the desirable management approaches for these woods.
- Parklands with 19th century origins or later with none of the above characteristics.

1. Old maps, these are variable across the country, but many do indicate unclosed grazed woodland as different from enclosed woodland, as is seen if one compares known wood pastures with known enclosed woods. A very useful source, especially in the uplands, is the 1st series 6 inch OS maps dating from 1860s and 1870s. At this time most coppices will still be shown as enclosed, any wood shown as unenclosed, with dense stands irregular in shape and with areas of open scattered trees is likely to be an ancient pasture woodland. Enclosed relic stands will, however often have been enclosed in the lowlands by this time.

2. The term veteran tree includes both ancient (massive limb loss and large visible hollows) and post mature trees (or shrubs) (thinning of crown and hollowing starting but not very visible yet). Old trees are a strictly a consequence of wood-pasture management and not part of the definition, but they do indicate sites likely to be of great biodiversity interest. The more the better but any are significant.

3. Significant numbers of herbivores must be present in working pasture woodland but these may have been long gone in relic sites. Presence in past can be significant in relic sites, if significant numbers of trees originated under grazing pressure survive.

4. and 5. Structure is a complex factor and can be very different between woods and between regions, but characteristic features are irregular boundaries, very uneven stocking, frequent glades and areas with scattered trees. In healthy and expanding wood pastures scrub and thickets of infilling young trees are also to be expected but are normally patchy in working pasture woodlands, only where all enveloping due to the cessation of grazing are these negative features. Closed canopy stands are also typical in many wood pastures but these will be in mosaics with more open stands, uniform even aged closed canopies are a negative feature, but not closed canopies per se. Non-boundary pollards nearly always indicate grazing but not all pasture woodlands have pollards. Alder pollards are highly indicative of summer grazed upland wood-pasture but unprotected Alder coppice on wet soils is characteristic of lowland pasture woodlands. Open grown trees and shrubs are typical but this does not mean just fully open grown individuals but also includes tall partially open grown ones with irregular growth forms in low density grazed high forest. No fixed boundaries with open vegetation.

6. Archaeological features will vary regionally and can include the total absence of features, as in many New Forest pasture woodlands, in particular an absence of boundary banks is a positive feature. Charcoal can be made from pollards or unenclosed Alder coppice, so a few charcoal heaths does not indicate enclosed coppice but a high density may.

7. Useful for 20th century, not usually before this.

Some wood-pastures have very clearly defined boundaries; in others it may be difficult to set limits and many may simply be part of a much larger range landscape. In the same way that a mire will be only part of a larger moorland ecology with the heath and grassland on drier ground wood-pasture is often intimately linked to non treed land. While it may be pragmatic to distinguish the area that represents the tree component of the wood-pasture from the broader grazing unit, this should not lead to the treed area being regarded as uniquely separate from the rest of the ecological unit.

This is intended as a guide to the identification of high quality relic and evolving wood pasture. Identification does not mean that all areas identified as such should be managed as wood-pasture but it is vital that its existence is appreciated and the possibility of maintaining or enhancing wood-pasture features considered. The positive features of grazing in woodland and the role of wood-pasture in planning ecological restoration needs recognition.

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