

Meres and Mosses

27 February 1998

Foreword

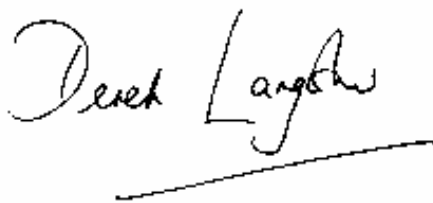
One of the key components of English Nature's *Strategy for the 1990s* has been the Natural Areas approach. We examined the local distinctiveness of each part of England, to identify their characteristic wildlife and natural features, and used this to define a comprehensive series of Natural Areas. Their boundaries are based on the distribution of wildlife and natural features, and on the land use pattern and human history of each area, and thus offer a more effective framework for the planning and achievement of nature conservation objectives than do administrative boundaries. They are **not** designations.

Wildlife is not restricted to designated and protected sites such as nature reserves or SSSIs; it occurs throughout the countryside, coast and built up areas of England. No part of the country is without some wildlife interest. The Natural Areas approach gives us a way of determining priorities for nature conservation areas with ecological and landscape integrity, and to set objectives which reflect these priorities. Together, all Natural Areas provide a powerful vision for nature conservation right across England.

The achievement of the objectives described for each Natural Area will be a key part of our new strategy *Beyond 2000*. The objectives will guide our work over the coming years, and we hope Natural Areas will allow us to help others in achieving what is best for nature conservation locally.

This Natural Area profile is one of a series of 120, one for each Natural Area. In it we describe the wildlife and natural features of the area, and what makes it special and distinctive. Each Natural Area profile is different, since it describes and reflects the local distinctiveness of the area, and therefore includes nature conservation objectives which are particular to that area. The profiles have been written after a wide range of local consultations, both on the boundaries of the Natural Areas themselves and on these profiles.

We hope you will find this document useful, and look forward to working with you to maintain and enhance the wildlife and natural features of England.

A handwritten signature in black ink that reads "Derek Langslow". The signature is written in a cursive style. Below the signature is a horizontal line that starts under the first letter and extends to the right, ending under the last letter.

Dr Derek Langslow
Chief Executive

Contents

1.	Natural Areas	4
2.	UK Biodiversity Action Plan	4
3.	General description	5
4.	Boundaries	7
5.	The Nature Conservation Resource	9
6.	Natural Area Habitats	12
6.1	Table of habitat classifications	12
7.	Key species (UK BAP lists of Globally Threatened/Declining Species)	13
7.1	Short list of globally threatened/declining species	14
7.2	Middle list of globally threatened/declining species	15
7.3	Long list of globally threatened/declining species	16
8.	Key sites	17
9.	Key issues	20
10.	Vision	21
11.	Key objectives	22
12.	Habitat profiles	23
12.1	Meres and their margins	23
12.2	Mosses and associated habitats	26
12.3	Swamp	29
12.4	Fen & fen grassland	31
12.5	Woodland	34
12.6	Heathland	37
12.7	Grassland	40
12.8	Flood plains	43
12.9	Ponds	44
12.10	Subsidence flashes and inland salt-marsh	47
12.11	Canals	49
13.	Geology	51
13.1	Salt subsidence, glacial features and pollen stratigraphy	52
13.2	Triassic sandstone exposures	53
13.3	Fluvial geomorphology	54
14.	Glossary	55
15.	References	58
16.	Habitat summaries	60

1. Natural Areas

The Natural Areas concept has been developed by English Nature from its *Strategy for the 1990's* document produced in 1993 and was launched in December 1996 by the publication of *The Character of England: landscape wildlife and natural features*. The aim is to provide a framework within which nature conservation objectives could be set.

The Natural Area approach describes the country in terms of bio-geographical units, which reflect the ecological integrity of its land areas, rather than by administrative boundaries. This provides the geographical focus for English Nature's work and the ecological basis for maintaining and enhancing the natural inheritance.

In defining the boundaries between Natural Areas, features such as physical land form, land-use and cultural influences were taken into account to reflect a widely-shared 'sense of place'. There is a total of 92 terrestrial Natural Areas within England, of which the Meres and Mosses is one, whose boundaries coincide with those of the 181 Character Areas developed by the Countryside Commission. This Natural Area comprises two Character Areas, the extensive Cheshire, Shropshire and Staffordshire Plain and the Cheshire Sandstone Ridge.

For each Natural Area a profile has been developed, which describes the characteristic natural resource of each area, highlights significant elements such as key biodiversity habitats and species, identifies the main issues which affect it and outlines objectives and visions for the future.

2. UK Biodiversity Action Plan

The UK Biodiversity Action Plan published in 1994 was a response to the Convention on Biological Diversity at Rio de Janeiro in June 1992 and signed by major heads of government. The main aims of the plan are to halt the world wide reduction in plant and animal diversity.

The principle aim of the UK's contribution is to conserve and enhance the biological diversity within the UK and to contribute to the conservation of global biodiversity through all appropriate mechanisms.

The Action Plans are based around species lists which have been selected to include threatened endemic and globally threatened species, species where the UK has more than 25% of the world population, species where numbers or range have declined by more than 25% in the last 25 years, where species are found in fewer than 15 ten km squares and species which are listed in the EC Birds or Habitats Directives, the Bern, Bonn or CITES Conventions or under the Wildlife and Countryside Act, 1981.

The severe declines in biodiversity outside the statutorily protected sites make a landscape scale approach essential to maintain viable populations of species and thus to meet the UK's Biodiversity Action Plan.

This document does not attempt to set specific achievement targets for these priority species and habitats. It is hoped that this study of natural features on a Natural Area basis helps

inform those Action Plans being drawn up by many groups across the three counties of the glacial plain.

3. General description

The Meres and Mosses Natural Area covers most of Cheshire, the northern half of Shropshire and part of north west Staffordshire (Figure 1). The initial impression is of an expanse of flat or gently undulating farmland, which is bounded by the hills on the borders of North Wales in the west, the Mersey valley in the north, the Pennines and Peak District to the north east the Shropshire Hills to the south and the industrial areas of the Midlands Plateau in the south. The Cheshire sandstone ridge cuts across the north west of the plain and view points along this, such as at Beeston Castle, Helsby Hill and from north of Whitchurch, provide phenomenal views over vast areas and it is possible on clear days, to pick out the borders of the area from the rising hills or glint of the conurbations which surround it. Despite its considerable area, most of the plain lies between 60 m and 100 m above sea level; the sandstone ridges rise to 220 m.

The wetlands of the plain are sustained primarily by wet weather systems arriving from the Atlantic, often entering the plain through the Cheshire Gap from the NW to fall as rain in the east against the Pennines. There are great fluctuations in the annual rainfall figures, ranging from 500 mm-1000 mm, eastern areas being about 10% wetter than the west. Of the basin's main rivers, all except the Gowy, Weaver and Tern are swollen primarily by Pennine or Welsh mountain rain.

The extensive, gently rolling plain is an agricultural landscape dominated by either intensive dairy farming, or by beef and arable production. The area was extensively cultivated in the late prehistoric, Roman and medieval period. Although the more waterlogged clay areas were slower to be utilised, woodland clearance, enclosure, rationalisation of the early field system and drainage have led to this intensive use, which in turn has created the lush pastoral character of the plain. Peaty areas proved the most difficult to 'improve'.

The Natural Area has scattered centres of population throughout and includes the county towns of Shrewsbury, Chester and Stafford.

The underlying solid geology of the Natural Area is almost entirely formed of red to brown Triassic sandstones, silts and muds, from the influx of a major river system from the south. Upper Triassic siltstones and mudstones accumulated in a lagoon or shallow gulf, and evaporation of this lagoon led to the extensive salt deposits found today.

The landform, soils and vegetation of the plain has been heavily influenced by the thick layer of glacial deposits consisting of boulder clay, silts and sands which overlie soft Keuper sandstone and marl. The ice sheet was up to 1 km thick over this area and as it moved, it scraped away all but the most resistant surface features. At the end of the last (Devensian) glaciation a rise in temperature started to melt the ice and as the glacier 'retreated', all the rock, stones, soils and debris which had been ground out of the landscape were dropped, either as unsorted boulder clays at the foot of the glacier or were washed away and sorted by the torrents of glacial melt water. The area is broken by the ridge of the Whitchurch moraine which marks the limit of one of the last glacial advances; to the north lie the drainage basins of the Dee, Gowy, Weaver and Dane and to the south the River Severn's upper catchment.

These rivers and their tributaries have eroded into the soft glacial surface and Keuper layers, creating the often wooded cloughs typical of the Cheshire plain.

It is thought that glacial meltwater trapped by the surrounding hills and moraines, caused the creation of a large lake over much of the southern part of the Natural Area, which has been called Lake Lapworth. The continual feeding of the lake by the existing river systems, eventually caused the lake to burst through a limestone ridge at Ironbridge in Shropshire, just to the south in the Shropshire Hills Natural Area, where the force of water carved out the steep valley sides of the Ironbridge Gorge and altered the course of the River Severn. This enormous water body, caused sediments entering into it to be deposited in a flat layer over the glacial till, and when the lake water finally drained away, the rivers found very little variety in gradient to force their flow. The result is a pattern of complex river meanders, reflecting the slow progression of water over the flat, drained lake bed.

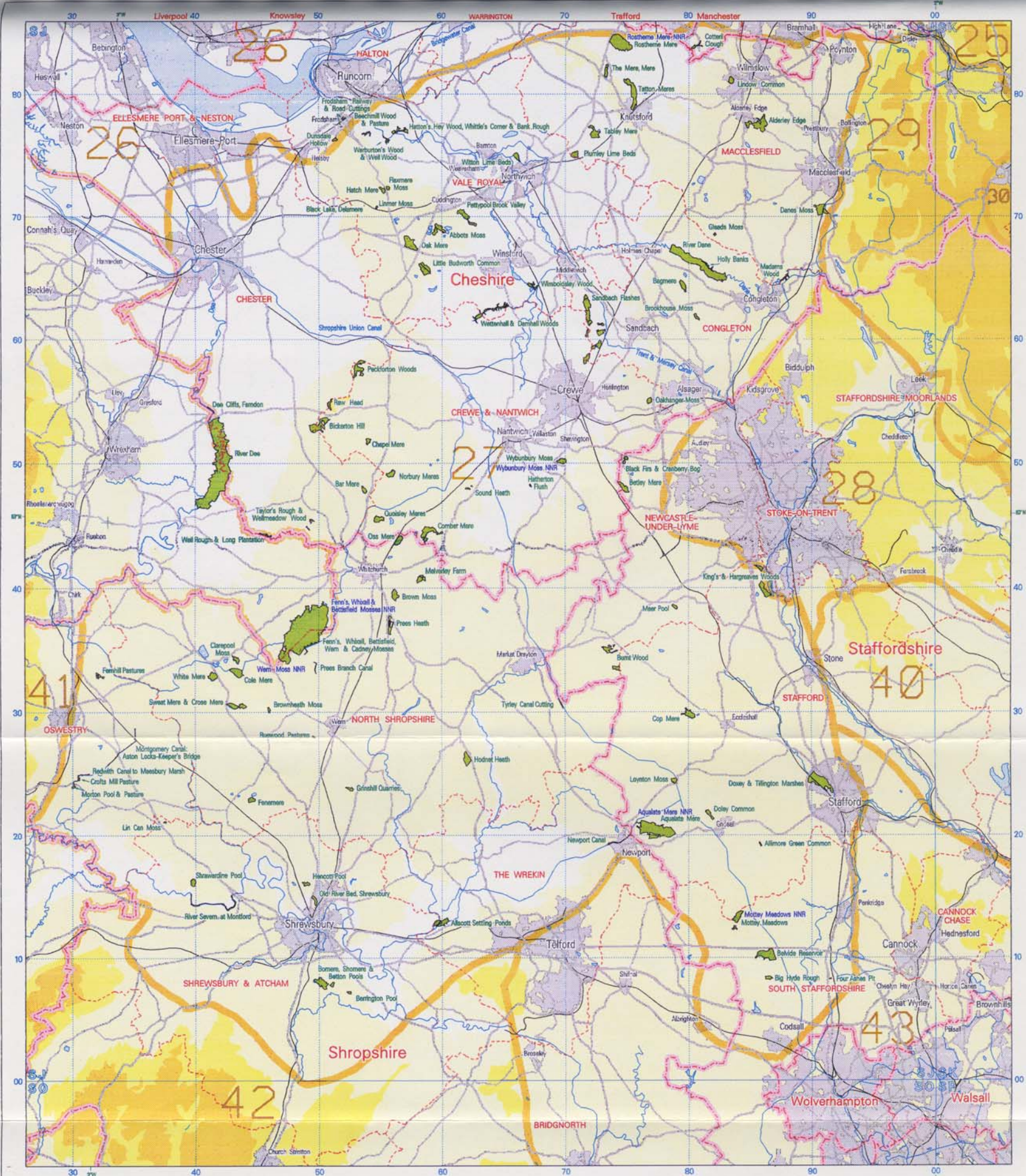
The meres and mosses are undoubtedly a unifying feature of the plain. These wetlands have not only an international importance for nature conservation but also provide evidence of glacial retreat in their mineral soils and local records of the vegetation colonisation of those bare soils to the present day, from the layers of preserved pollen found in the peatland 'archives'.

Although dominated by the low lying plain, there are scattered outcropping sandstone hills, glacial moraine and steep stream and river valleys, which provide relief to this otherwise homogeneous landscape. These features also endow this area with a variety of habitat types such as clough woodland and heath which are able to survive where intensive agriculture is not possible due to factors such as the steepness of slope, or the poorness/acidity of the sandy soils.

Human activity has contributed both positively and negatively to the nature conservation resource of this area, as a by-product of agricultural and industrial activity and as a consequence of direct action. The digging of 'Marl pits' for example, has created tens of thousands of ponds and pools throughout the area, which support important populations of animals and plants. The industrial extraction of underground salt in central Cheshire, has led to subsidence flashes, which have resulted in the formation of salt-marsh communities which are rarely found inland. Salt based chemical industries has resulted in the creation of sludge beds of caustic, but lime-rich, materials, attracting a very different fauna and flora. Sand extraction, especially within Delamere Forest and E Cheshire, has created many new water bodies and areas of heathland to be set against the losses of natural features. However the greatest pressures on the resource are from intense agricultural activity, transport infrastructure, housing and waste disposal. This invariably results in the continued loss, fragmentation and degradation of remaining sites and their linking habitats with the inevitable consequential loss of biodiversity and viability of populations of rare species characteristic of the Natural Area.

4. Boundaries

Although the boundaries to the Natural areas are generally clearly defined by the surrounding natural features as described above, eg along the foot of the Pennines and South Shropshire Hills, along some boundaries there are not such clear divisions. In the north east around Macclesfield and Wilmslow, there is a transition zone where the moss land basins take on the more extensive character of the Upper Mersey Basin's raised mires. The boundary to the south east in Staffordshire is less well defined and landscape and ecology merge gradually into the Trent Valley system. In this transitional corner of the Natural Area are dry and marshy grasslands on mineral soils which are infrequently encountered across the plain to the north west.



Nature Conservancy Council for England
 ENGLISH NATURE
 1:300000

Meres & Mosses Natural Area

Land under 200ft
Land between 200ft < 600ft
Land between 600ft < 1000ft
Land over 1000ft

- Status of each of the Key Sites
- Site of Special Scientific Interest as notified under the Wildlife & Countryside Act 1981, e.g. Lin Cem Moss
 - National Nature Reserve as declared under the National Parks & Access to the Countryside Act 1949 or the Wildlife & Countryside Act 1981, e.g. Wern Moss NNR

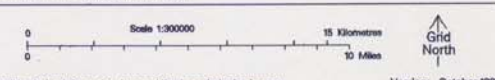
- Natural Areas information
- Meres & Mosses Natural Area boundary

- Natural Areas Index
- 25. Dark Peak
 - 28. Urban Mersey Basin
 - 27. Mosses and Meres
 - 28. Potteries and Churnet Valley
 - 29. South West Peak
 - 30. White Peak
 - 40. Needwood and South Derbyshire Claylands
 - 41. Oswestry Uplands
 - 42. Shropshire Hills
 - 43. Midlands Plateau

- Administrative areas
- County or Unitary boundary
 - County or Unitary name
 - District boundary
 - District name
- Administrative area information on it correct to April 1996

- Other features
- Motorway
 - A road
 - B road
 - Railway

This map is intended as a location or overview map. Site boundaries are derived from larger scale mapping and may not match the background detail



Background detail is derived from the Automobile Association's dataset © Automobile Association 1991
 The grid on this map is the National Grid taken from the Ordnance Survey map with the permission of the Controller of Her Majesty's Stationary Office
 Produced by Geographic Information Unit, English Nature © English Nature 1997
 Version: October 1997
 Plotted: 31 Dec 1997
 Ref: 911trap

5. The Nature Conservation Resource

Within all Natural Areas there are habitat types which are characteristic of that area and as such they should be the focus for nature conservation and biodiversity. Outline descriptions of the most characteristic features of the Meres and Mosses Natural Area follow. These are further developed in later sections.

- **Meres**
These are water bodies in hollows formed during the retreat of the last glaciers. Because of their long and comparatively undisturbed history, the Meres are often associated with a variety of wetland habitat types which illustrate natural progressions from open water through swamp and fen habitats, to wet willow or alder woodland. Many types of insect are associated with these diverse wetland habitats of which there are many examples scattered or clustered throughout the plain.
- **Mosses**
These are bog communities also developed in glacial hollows, which similarly provide a habitat for an extensive range of rare and highly specialised plants and animals. Mosses develop where a build up of peat produces very acidic conditions. A number of 'moss' types have developed either over extensive areas as a shallow dome or in smaller basins. Their relationship with the meres can be seen where a floating raft of mosses covers a remnant lens of water. Such 'schwingmoors' are rare internationally, but several fine examples occur in Delamere Forest, Cheshire, and at scattered locations in Shropshire.
- **Swamp**
Single species dominated swamps are found around open water habitats, particularly the mere systems, where they form a transitional stage between open water and fen and also along river flood plains. This Natural Area is one of the few locations for lesser pond-sedge fen outside the Fens and Broad. Frequently woody shrubs such as willow become established, developing eventually into carr woodland. Swamp is also found in ponds, canals and flood plains.
- **Fen and Fen Grassland**
This range of wetland habitats includes at its wettest end those tall-herb dominated communities where swamp types have become colonised by a diversity of marshland plants. Associated with acidic water a 'poor (in nutrients) fen' of shorter vegetation, with bog mosses, develops as peat accumulates. In nutrient richer situations 'tall or rich fen' is found, and where either type becomes dry enough for grazing, a grassier, species-rich, damp peaty pasture develops. Most typically these fen types are found in the glacial hollows around meres and mosses, but in contrast are also found on grazed slopes in flushed areas fed by spring-line seepages.
- **Ancient Woodland**
Ancient woodland is virtually absent from the flat plain of the Meres and Mosses Natural Area. The steep valley sides of streams and rivers are impracticable for intensive agriculture and it is here that the clough woodlands remain, many of which are ancient and can support a rich and varied ground flora and insect fauna. Found

mainly in the north of the Natural Area, the valleys of the Rivers Dane and Weaver are particularly well endowed with woodland of this type, along their flanks and tributary valleys, where Keuper bedrock has been exposed.

A very different oak/birch/rowan woodland is typical of the sandstone ridges. Although steeper rocky cliff areas are likely to be ancient and continuously wooded, more gentle slopes may have been subjected to periods of grazing throughout history implying a secondary origin to their heathy woodland.

- **Heathland**

Wet and dry heathland are found scattered within the area. Both types of heathland are becoming increasingly restricted in their range, and support species dependent on this specialised and if unmanaged, transitory habitat. Wherever the soil is sandy, in slightly elevated areas, one is likely to encounter heathland, or at least areas which were formerly heathland, given away in place names such as Prees Heath and Reaseheath.

- **Unimproved grassland**

Agriculturally unimproved grassland is now a very scarce habitat across the plain. Small areas of species rich grassland survive on slopes inaccessible to machinery. Their nectar sources, in juxtaposition with ancient clough woodlands are especially important for insects. Traditional hay meadow management, once widespread is now extremely rare. Nevertheless a few important examples survive scattered across the plain.

- **Flood plains**

The flood plains of the main rivers are also characteristic features of the Natural Area which have escaped built development and the most intensive agricultural usage. As well as their geomorphological interest (described in other sections) they retain areas of semi-natural vegetation such as swamp, fen and marshy grassland important to breeding and overwintering waterfowl and hunting barn owls. The river channels themselves, especially those with unpolluted waters, are noted for dragonflies, kingfishers, cray fish and the returning otter.

- **Ponds**

From ancient times to the 19th centuries 'Marl' has been used as a soil conditioner. Its calcareous nature would neutralise soil acidity and there were many cases where clay was spread on to sandy soils to improve their physical structure. Thousands of hollows were created, often one in each field, which quickly filled with water due to the underlying clay and have since become colonised by a rich variety of aquatic species. In a similar way ponds have been created in sandy areas, following the hand-digging of sand. Although more acidic they are just as important for aquatic plants and animals. Ponds could be described as artificial mini meres and mosses and are absolutely characteristic of the Natural Area.

- **Subsidence flashes and inland salt-marsh**

The flashes have formed as a by-product of the salt extraction industry in Central Cheshire. The collapse of underground voids left by the solution and removal of salt as brine has led to the development of unusual inland saline water bodies and salt-

marsh communities. Their shallow water and muddy margins attract large numbers of migrating and over wintering birds. Some flashes have subsequently been used to dispose of waste industrial sludges. These inhospitable environments have now weathered and become colonised by a characteristic community of lime-loving plants more typical of sand dune slacks than of this Natural Area.

- **Canals**

Canals were built to service the industrial development of the last century, and many fell into disrepair with the coming of the railways. Most of the navigable stretches of canal are now used primarily for pleasure craft. The flora and fauna of canals has changed to reflect this changing human use. Many plants and animals spread along the canals during the era of horse-drawn boats. With disuse the plants spread to impede navigation. The use of motor-driven boats, especially for leisure, has been accompanied by dredging and a great increase in turbidity which has obliterated much of the former interest except in a few disused stretches. Several fine examples of these corridor wetlands can be found in Shropshire.

- **Salt subsidence, glacial features and pollen stratigraphy**

This key resource comprises a range of features which provide evidence of the ancient landform and vegetation history of the area. Beneath the glacial soils are beds of underground salt which formed on the floor of ancient tropical lagoons. Man's removal of this salt and natural solution has caused localised subsidence, typical of northern parts of the Natural Area. Of more recent origin we have glacial landforms, features which chart the action and progress of the different phases of the last glaciation. A record of the subsequent vegetation colonisation and its modification by man is preserved within the layers of mossland peat. A number of glacial hollows have subsequently become deepened by salt subsidence, such as at Rostherne and at Wybunbury.

- **Triassic sandstone outcrops**

A discontinuous sandstone ridge runs from the Mersey Estuary through the north of the natural area, almost to the Shropshire Cheshire border. The outcrops of Triassic rocks demonstrate cross-bedding, indicating that they were originally formed from windblown sand dunes. The ridge supports extensive, ancient oak woodland and heathland, and acidic grassland in contrast to the surrounding plain.

- **Fluvial geomorphology**

The rivers which run through the Meres and Mosses Natural Area such as the Dane, Dee and Severn, provide important information about the erosion and deposition processes of rivers and historical evidence of the patterns and course of these rivers since the last glaciation.

6. Natural Area Habitats

6.1 Table of habitat classifications

The table below links the above habitats with those highlighted in the 1995 Biodiversity Steering Group report, of which the Meres and Mosses Natural Area contains a nationally significant proportion of fen habitat. Habitats listed under the EC Habitats Directive, where represented by candidate Special Areas of Conservation (cSAC) within the Natural Area, are also cross-referenced by the table.

Natural Area Habitat	Biodiversity Key Habitats	EC Habitats
Meres	Dystrophic lakes Oligotrophic lakes Mesotrophic lakes Eutrophic lakes Aquifer-fed, naturally-fluctuating standing water	Dystrophic lakes Oligotrophic waters containing very few minerals of Atlantic sandy plains with amphibious vegetation: <i>Lobelia</i> , <i>Littorella</i> and <i>Isoetes</i> .
Mosses	Raised bog Valley mire Basin mire	Active raised bog Transition mires and quaking bogs.
Swamp	Reedbed	
Fen and Fen Grassland	Fen Springs and flushes	
Woodland	Wet woodland Lowland acidic oakwood	
Heathland	Lowland heathland	
Grassland	Lowland hay meadow and pasture	
Flood plains	Floodplain grazing marsh	
Ponds	Ponds	
Flashes	Inland saltmarsh	Brackish waters (inland)?
Canals	Canals	

7. Key species (UK BAP lists of Globally Threatened/Declining Species)

The Meres and Mosses Natural Area holds populations of some species whose conservation is significant in either international or national terms. The habitat summaries at the end of this document lists these species and identifies their significance within the key resource area.

The following tables summarise the species which occur within the Natural Area and which are on the lists drawn up for the Biodiversity UK Steering Group Report. There are three lists; the short list for which action plans have been drawn up, a middle list for which action plans will be produced in the next three years and a long list which contains species of conservation concern (although the list is not comprehensive). The short and middle list contain species which are either globally threatened or are rapidly declining in the UK (by more than 50% in the last 25 years). The long list includes species which are listed in the EC birds or Habitats Directive, the Berne, Bonn or CITES Conventions or under the Wildlife and Countryside Act 1981.

Within the Meres and Mosses Natural Area significant populations of pipistrelle bats, great crested newts and floating water plantain occur which are on the short list of Globally Threatened/Declining Species.

Key to codes used in the following two tables Short and middle lists of globally threatened/declining species

International threat

- 2 Species of global conservation concern
- 2? Status uncertain - possibly 2
- 1 Unfavourable conservation status in Europe
- 0 Favourable conservation status in Europe

International importance

- 3* Believed endemic
- 3*? Possible endemic
- 3 75% of the world population in the UK
- 2 50-74% of the worlds population in the UK
- 1 25-49% of the worlds population in the UK
- 0 0-24% of the worlds population in the UK

Decline

- 2 50-100% decline in numbers/range in GB in last 25 years
- 1 25-49% decline in numbers/range in GB in last 25 years
- 0 0-24% increase or decrease in numbers/range in GB in last 25 years
- 1 25-49% increase in numbers/range in GB in last 25 years
- 2 50+% increase in numbers/range in GB in last 25 years

7.1 Short list of globally threatened/declining species

Mammals	Int. Threat	Int. Importance	Decline	Preferred habitat
water vole	0	0	1	rivers, streams & ponds
otter	2?	0	-1	rivers & streams
brown hare	0	0	1	farmland
dormouse	1	0	1?	woodland with extensive hazel coppice
pipistrelle bat	1	0	1	farmland; woodland & scrub, urban areas
Birds				
grey partridge	1	0	2	farmland; grassland, scrub
skylark	1	0	2	farmland; grassland
bittern	1	0	2	open reedbed
song thrush	0	0	2	woodland & scrub; farmland
Amphibian				
great-crested newt	1	0	1	ponds, rough grassland
Molluscs				
depressed river mussel <i>Pseudanodonta complanata</i>	2	0	0	rivers and channels
freshwater pearl mussel <i>Margaritifera margaritifera</i>	2	0	0	fresh water
Beetle				
<i>Obera oculata</i>	?	?	2	fen and carr
Butterfly				
marsh fritillary	1	0	2	damp neutral or acid grassland
Cricket				
mole cricket	1?	0	2	well drained margins of wet areas
Crustacean				
white-clawed crayfish	2	0	1	streams, rivers and lakes.
Vascular plant				
floating water plantain	1	1	0	canals
Moss				
slender green feather-moss <i>Hamatocaulis vernicosus</i>	1?	0?	?	Lowland sedge fen & upland flushes

7.2 Middle list of globally threatened/declining species

Birds	Int. Threat	Int. Importance	Decline	Preferred Habitat
nightjar	1	0	2	sandy heaths, mosses
linnet	1	0	2/1	farmland; dwarf shrub heath
reed bunting	0	0	2	marshy ground and wet areas
corn bunting	0	0	2	farmland
spotted flycatcher	1	0	2	outskirts of woods, pools, streams
tree sparrow	0	0	2	lowland farmland
bullfinch	0	0	2	farmland, orchards
Invertebrates				
silver-studded blue	0	0	2	lowland heath
Vascular Plants				
grass-wrack pondweed	0	0	2	open water
small-flowered catchfly	0	0	2	
marsh clubmoss	0	0	2	lowland peat bogs, wet acid heaths

7.3 Long list of globally threatened/declining species

Mammals

hedgehog
badger
stoat
weasel
Daubentons bat
noctule bat
brown long-eared bat
whiskered bat
Leisler's bat
Natterer's bat
common shrew
pigmy shrew

Birds

sparrowhawk
sedge warbler
reed warbler
kingfisher
shoveler
teal
wigeon
mallard
gadwall
greylag goose
meadow pipit
tree pipit
long-eared owl
pochard
tufted duck
buzzard
goldfinch
greenfinch
siskin
treecreeper
little ringed plover
dipper
hawfinch
quail
ringed plover
mute swan
house martin
greater spotted woodpecker
lesser spotted woodpecker
yellowhammer
reed bunting
kestrel
pied flycatcher

goshawk
snipe
hobby
swallow
grasshopper warbler
common crossbill
nightingale
pied wagtail
grey wagtail
yellow wagtail
curlew
wheatear
coal tit
blue tit
great tit
willow tit
marsh tit
tree sparrow
redstart
chiffchaff
wood warbler
willow warbler
green woodpecker
black-necked grebe
dunnock
water rail
goldcrest
sand martin
whinchat
stonechat
woodcock
nuthatch
tawny owl
blackcap
garden warbler
whitethroat
shelduck
redshank
redwing
fieldfare
barn owl
lapwing
golden plover

Reptiles

grass snake
adder
slow worm

Amphibians

common frog
smooth newt
palmate newt
common toad

Fish

grayling

Damsel/ Dragonfly

white-faced dragonfly

Beetle

lesser silver water beetle

Vascular Plants

heath cudweed
bog orchid
pillwort
cornflower
bluebell
river water-crowfoot
ivy-leaved water-crowfoot
western gorse
corn buttercup
prickly sedge

8. Key sites

The following sites are designated as Sites of Special Scientific Interest within the Meres and Mosses Natural Area. They have been ordered to their major Key habitat type, however it should be noted that many sites are transitional or may include more than one key habitat.

Site Name	County
Meres and Mosses	
Abbots Moss *	Cheshire
Aqualate Mere *	Staffordshire
Bagmere *	Cheshire
Bar Mere	Cheshire
Berrington Pool *	Shropshire
Betley Mere *	Staffordshire
Black Firs & Cranberry Bog *	Staffordshire
Black Lake / Delamere	Cheshire
Bomere, Shomere & Betton Pools *	Shropshire
Brookhouse Moss	Cheshire
Brown Moss *	Shropshire
Brownheath Moss *	Shropshire
Chapel Mere *	Cheshire
Clarepool Moss *	Shropshire
Cole Mere *	Shropshire
Comber Mere	Cheshire
Cop Mere *	Staffordshire
Danes Moss	Cheshire
Doley Common	Staffordshire
Fenemere	Shropshire
Fenn's, Whixall, Bettisfield, Wem & Cadney Mosses*	Shropshire
Flaxmere Moss *	Cheshire
Gleads Moss	Cheshire
Hatch Mere *	Cheshire
Hencott Pool *	Shropshire
Lin Can Moss	Shropshire
Linmer Moss *	Cheshire
Loynton Moss	Staffordshire
Maer Pool	Staffordshire
Marton Pool, Chirbury *	Shropshire
Morton Pool & Pasture *	Shropshire
Norbury Meres	Cheshire
Oak Mere *	Cheshire
Oakhanger Moss *	Cheshire
Oss Mere *	Shropshire

Site Name	County
Pettypool Brook Valley	Cheshire
Quoisley Meres *	Cheshire
Rostherne Mere *	Cheshire
Shrawardine Pool	Shropshire
Sweat Mere & Crose Mere *	Shropshire
Tabley Mere	Cheshire
Tatton Meres *	Cheshire
The Mere, Mere *	Cheshire
White Mere *	Shropshire
Wynbunbury Moss *	Cheshire
Clough Woodland	
Beechmill Wood And Pasture	Cheshire
Hatton's Hey Wood, Whittle's Corner And Bank Rough	Cheshire
Holly Banks	Cheshire
Madams Wood	Cheshire
Taylor's Rough And Wellmeadow Wood	Cheshire
Warburton's Wood And Well Wood	Cheshire
Well Rough And Long Plantation	Cheshire
Wettenhall And Darnhall Woods	Cheshire
Wimboldsley Wood	Cheshire
Triassic Geology	
Alderley Edge	Cheshire
Dee Cliffs / Famdon	Cheshire
Frodsham Railway And Road Cutting	Cheshire
Grinshill Quarries	Shropshire
Raw Head	Cheshire
Tyrley Canal Cutting	Shropshire
Lowland Heath	
Bickerton Hill	Cheshire
Hodnet Heath	Shropshire
Lindow Common	Cheshire
Little Budworth Common	Cheshire
Prees Heath	Shropshire
Sound Heath	Cheshire
Canal	
Montgomery Canal, Aston Locks To Keepers Bridge	Shropshire
Newport Canal	Shropshire
Prees Branch Canal	Shropshire
Grassland	
Allimore Green Common	Staffordshire
Crofts Mill Pasture	Shropshire

Site Name	County
Fernhill Pastures	Shropshire
Hatherton Flush	Cheshire
Molverley Farm Meadows	Shropshire
Mottey Meadows	Staffordshire
Rue wood Pastures	Shropshire
Industrial	
Allscott Settling Ponds	Shropshire
Plumley Lime Beds	Cheshire
Sandbach Flashes	Cheshire
Witton Lime Beds	Cheshire
Other Woodland	
Big Hyde Rough	Staffordshire
Burnt Wood	Staffordshire
Dunsdale Hollow	Cheshire
King's And Hargreave Wood	Staffordshire
Peckforton Woods	Cheshire
River geomorphology	
River Dane	Cheshire
River Dee	Cheshire
River Severn At Montford	Shropshire
Marsh	
Doxey & Tillington Marshes	Staffordshire
Old River Bed, Shrewsbury	Shropshire
Other	
Belvide Reservoir	Staffordshire

* - Part of Ramsar site

SSSI Habitat	No. Sites
Meres & Mosses	45
Clough woodland	9 (only in Cheshire)
Triassic Geology	6
Heathlands	6
Canals	3 (only in Shropshire)
Grassland	7
Industrial	4
Other Woodland	5
River Geomorphology	3
Marsh	2
Other (Reservoir)	1

91

9. Key issues

Key issues are those which are common to many of the key natural resource features within the Natural Area:

- Loss, degradation and abuse of the existing resource.
- Isolation of sites leading to impoverishment of communities and stagnation of the genetic variation within populations of plants and animals.
- Lack of consistent base-line data.
- Need for management plans and agreements with land owners and users.
- Funding through European 'Life' funding and Countryside Stewardship for example which can focus funds on the creation and management of priority habitats and their juxtaposition.
- Control of invasive species.
- Education and interpretation of sites, their habitats, species and the natural processes which they demonstrate.

If all these issues were to be addressed the Natural Area would progress towards a more favourable future state. The vision statement which follows demonstrates how such a state could be achieved with the coordinated efforts of land owners and managers, countryside advisors and planners, regulators and grant aiders.

10. Vision

Nature Conservation in the next Millennium is set to extend its horizons beyond the boundaries of nature reserves and protected sites into preserving and restoring the natural fabric of the wider countryside. The safeguarding and maintenance of key sites will still be central, but for such sites to remain viable into the next century, ways must be found of re-establishing the links between these 'semi-natural islands' and restoring the wider ecosystems of which they form part.

Such habitats in Britain now largely exist as a highly fragmented patchwork of discrete sites that have become increasingly isolated from each other through the ramifications of direct habitat destruction, the decline of traditional countryside management and agricultural intensification. As habitats become smaller and more isolated from each other, so the number and diversity of species they can support diminishes, ultimately resulting in localised extinctions.

As semi-natural habitats have shrunk in size, so fields have gained in size, creating a more uniform landscape in which the overall diversity of the countryside has declined. For example, mixed farming systems which benefit birds by providing a range of food and fringe habitats throughout the year, are being replaced by monocultures which have a negative impact on the breeding success of farmland birds. One of the main aims of conservation in the next century will be to reverse this trend and to stem the process of habitat fragmentation by restoring degraded habitats to their full potential and finding ways to ameliorate conflicts between farming practices and wildlife.

The opportunities for habitat creation, management and development must focus on the extension of the existing resource focusing on prime biodiversity areas. The creation of additional islands may be locally desirable, but in order to provide habitats which are of value to wildlife and enhance the wider resource they should form part of a coherent whole. To this end a strategy which identifies the existing resource and develops targets for enhancement, non-intervention and creation of links through habitat creation or changes of management practice should be developed. At the same time, the value of 'islands' to prevent the spread of undesirable species should not be overlooked.

In order to allow for the structured protection and development of the natural resource it is essential to ensure that a consistent base line of data for the resource is established, one which can be used to monitor changes in the character of the area and enable remedial action to be taken. Geographic Information Systems could be an invaluable aid in prescribing best habitat creation and also provide visual feedback on success.

The Meres and Mosses Natural Area forms a focus for internationally important wetland habitats and protection from commercial exploitation and agricultural intensification is of paramount importance. The extension of this resource to form links through wetland creation and appropriate management of existing sites would ensure long term genetic variability of declining species, the spread of species between sites and conserve its unique features.

Woodland is poorly represented throughout the Natural Area and it is envisaged that there will be an extension of the existing resource, by allowing adjacent or nearby areas to develop woodland through natural processes, both along water courses and into adjacent agricultural land. Transitional habitats such as scrub, would add valuable wooded diversity. Great care

will have to be taken to ensure that other scarce resources, such as heathland and traditionally managed grassland are not lost in this push for restoration of tree cover. Existing woodland could be enhanced by reinstating neglected traditional management to increase structural diversity. Abrupt margins can be modified by allowing abutting hedgerows to grow up.

These objectives can only be achieved with the cooperation and interest of landowners and managers. This is likely to be more important than the redistribution of agricultural subsidies, although this shift in emphasis is clearly needed to ‘oil the wheels’.

While it is impossible to create old grassland, the neglect of some improved agricultural grazing, allowing it to become more tussocky, would benefit populations of small mammals which in turn might save our dwindling barn owl population.

Where management skills have been lost over the generations, EN hopes by demonstration of its tried and tested management of National Nature Reserves, to promote ‘best practice’ more widely. Valuable experience has also been gained on reserves managed by the RSPB and County Wildlife Trusts. Communication and dissemination is essential to develop conservation management in the future. Long-standing neglect may require minimal intervention but more intense, apparently damaging, management may be needed to restore habitats such as heathland. Habitat creation often demands new and poorly tested skills.

It is essential to work towards the achievement of an ideal state within the Natural Area, in which there is opportunity for the maintenance and expansion of species diversity, protection and understanding of the dynamics operating within and on habitats and a balance between these and human influences. Further areas of semi-natural vegetation are still being lost to development. Those who plan and determine our future environment will need to find ways to guide development, with minimal impact, into nature's network.

To achieve the vision, key objectives have been developed, which will be used to direct the energies and resources of English Nature within this Natural Area. It is hoped that other groups and individuals will also adopt the objectives to conserve the natural character of the glacial plain.

11. Key objectives

Key objectives are applicable to many different habitats and follow as a consequence of the generalised Key Issues listed earlier. These have been shown in italics throughout the habitat profiles which follow.

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To seek opportunities to extend the existing resource, utilising especially the funds available via agri-environment and other countryside enhancement schemes.*
- *To have all sites identified, comprehensively surveyed, described and assessed.*
- *To have in place practicable monitoring programmes to gauge any further degradation or improvement of natural features.*

- *To restore semi-natural habitats in sub-optimal condition to optimal condition.*
- *To prevent the isolation or severance of rare communities through strategic, monitored programmes of habitat creation and enhancement, which focuses on high biodiversity areas.*
- *To encourage and facilitate the completion of management plans agreed by land users, which will direct management towards the enhancement of key species and communities.*
- *To minimise the direct impact of pollution, enrichment and encroachment from site edges through the development of buffer zones around all key sites.*
- *To involve owners and occupiers in the management of sites as part of their wider surroundings, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

12. Habitat profiles

12.1 Meres and their margins

The paramount conservation importance of the meres sites and their flanking wetland habitats has been recognised in an international and national context by the number which qualify for or have statutory designations. The rare natural qualities of Oak Mere's waters have been singled out as a candidate Special Area for Conservation (SAC) under the EC Habitats Directive and 20 Meres contribute their diverse wetland communities to the Midland Meres and Mosses Ramsar site. The Meres at Aqualate and Rostherne have been declared National Nature Reserves while almost 40 of the 60 or so main mere sites within the Natural Area have Site of Special Scientific Interest (SSSI) status.

The meres range in size from over 70ha at Aqualate Mere, to small pools of less than 1ha. Many were formed from enormous lumps or 'bergs' of ice which were stranded as the ice sheet retreated. When the stranded ice-bergs had melted, a hollow or kettle hole was left in the surrounding glacial debris, which filled with ground water or surface drainage. Some meres have been subsequently deepened by subsidence, following the washing away of underground salt deposits by groundwater movement, such as at Rostherne Mere which is now 30m deep. In contrast Aqualate Mere lies in a shallow depression, scoured by the moving ice sheet.

The meres may form extensive areas of open water such as at Combermere or Tatton Meres and may have beds of aquatic plants or rafts of floating vegetation, whilst others have a range of fringe habitats such as reed swamp, fen and wet woodland of willow or alder. The frequently associated habitats are dealt with more fully in later sections. Depending on the depth of the basin and its water chemistry, any of these successional stages could offer the correct conditions for Sphagnum mosses to colonise the surface, beginning the process of moss peatland development as is superbly demonstrated at Oakhanger Moss, which was a mere as recently as the 19th Century.

Characteristic species

The high nutrient levels found in many of the meres produce 'blooms' of green and blue green algae in summer and autumn, known locally as the 'breaking of the Meres'. These blooms cause shading which may be partly to blame for the relatively few aquatic plants growing in some meres. Meres with lower nutrient levels such as Bomere, have a wider range of aquatic plants including autumnal water-starwort, which has a scattered distribution in the British Isles, small pondweed which thrives in the underwater margins and fan-leaved water-crowfoot which is sparsely scattered in England and pushes its white, buttercup-like flowers out of the water.

Where the shores of the mere are open and undisturbed by wave action or grazing animals, shallow margins will become suitable for reed swamp. These margins are often dominated by reedmace or common reed. The dead remains of these plants build up year on year, reducing the water depth and producing a nutrient rich peat surface, in which a variety of fen plants such as great-fen sedge, tufted sedge and bottle sedge can thrive. Where this process is unchecked, woody species will begin to invade and eventually fen woodland, willow or alder carr, which is important for lesser spotted woodpecker and willow tit, will become established.

Open water habitats are essential for a characteristic range of animals particularly bats, birds and insects many of which are dependent on the surrounding hydrosere. Species including heron of which Aqualate Mere supports a large colony, tufted duck, coot and kingfisher, which is a candidate Red Data Book species, are commonly seen. The variety of habitats and tranquillity of many of the larger water bodies provide an excellent refuge for breeding and wintering wildfowl. Rostherne NNR in particular has been managed as a wildfowl refuge and attracts vast numbers of wintering wildfowl including mallard, teal, gadwall and up to 10,000 black headed and common gull may gather at dusk. The complexity of wetland and marginal habitats also attracts a wide variety of insects especially damsel and dragonflies, such as the red-eyed damselfly, which will hunt, mate and breed along the margins of the water. The profusion of insects also attracts birds such as swallows and martins, and bats such as Pipistrelle, Whiskered/Brandt's, Daubentons, Natterers and Noctules. Mature trees on the edges of meres are known to be used as maternity roosts, for example the Noctules at Copmere.

Significant Species

The Meres are particularly important for aquatic plants, and molluscs, and those insects and birds which are dependant upon the open water habitats and fringing vegetation for shelter, feeding and the completion of their life cycles. Some unusual, localised and decreasing plant species can be found such as marsh fern, floating least water-lily and cowbane within different parts of the mere system. Birds which are declining, such as shoveler and pochard find refuge on the larger water bodies. Significant species of insect such as the downy emerald dragonfly which is more usually found in southern England and several beetles which rely on the build up of fen litter have been recorded.

Extinct /declining species

As well as a diversity of more common species found in the meres and their associated habitats, a few have been recorded which are declining nationally or internationally. These

include the black-necked grebe which has been known to breed in the area. There are also records of a rare fly *Tetanocera freyi*, for which there are only eleven locations known in Britain and the variable damselfly and hairy dragonfly both of which are more usually found in the south.

Issues

- Enrichment of the water, resulting from the use of fertilisers on surrounding farmland.
- Siltation of some meres resulting from cultivation along inflow streams.
- Reduction of water levels as a result of direct and adjacent abstraction and the widespread lowering of the water table resulting from local mineral extraction, development etc. The impacts of abstraction may affect sites located some distance away.
- Absence of buffer zones around meres allows the effects of disturbance and agricultural spray drift to directly affect the mere system.
- Recreational activities may disturb sediments, damage vegetation, pollute and directly disturb sensitive species, especially breeding waterfowl.
- Angling may affect the existing composition of plant and animal species through the introduction of fish, which can disturb the entire ecosystem.
- Pollution of water from petrochemicals may occur from spills on adjacent roads, or from the use of power driven boats.
- There is only a partial understanding of the ecological dynamics of each mere system, which makes it difficult to assess potential impacts of proposed changes.
- Introduction of plants.
- Theft of plants.

Objectives

Key Objectives

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To have all sites identified, comprehensively surveyed, described and assessed.*
- *To have in place practicable monitoring programmes to gauge any further degradation or improvement of natural features.*
- *To restore meres and their fringe habitats in sub-optimal condition to optimal condition.*

- *To encourage and facilitate the completion of management plans agreed by land users, which will direct management towards the enhancement of key species and communities.*
- *To minimise the direct impact of pollution, enrichment and encroachment from site edges through the development of buffer zones around all key sites.*
- *To involve owners and occupiers in the management of sites as part of their wider surroundings, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

Additional habitat-specific objectives

- To maintain and where necessary restore the hydrological integrity of the meres, with water levels stabilised to within their natural seasonal fluctuation.
- To protect those water tables sustaining wetlands, by opposing proposed abstractions which may have a detrimental effect.
- To minimise external sources of pollution and enrichment throughout the catchment areas of the meres.
- To restore water bodies which have become degraded by drainage or pollution.
- To improve the understanding of the ecology and impacts on the meres through an active and refined research programme, and to channel improved understanding to land managers.
- To control the impact of 'pest' species within manageable limits, through attention to the status of eg Canada goose, ruddy duck, mink, New Zealand stonecrop.
- To maintain the meres in a state as quiet and undisturbed as possible through appropriate conservation and recreation management.

12.2 Mosses and associated habitats

As the naming of this Natural Area shows, the mosses are a central element of its natural resources. Their international importance is recognised by the designation of 10 mosslands as part of the Midlands Meres and Mosses Ramsar site. Fenn's, Whixall, Bettisfield, Wem and Cadney Mosses is also a candidate SAC, as a series of active, albeit degraded raised bogs. The West Midlands Mosses is a second cSAC comprising Abbots Moss, Wybunbury Moss, Clarepool Moss and the outlying Chartley Moss in east Staffordshire, which highlights the importance of their floating bogs and bog pools. In all, 17 mosses have been notified as SSSIs including Wybunbury Moss, Wem Moss and the Fenn's complex which are both NNRs.

These ancient wetlands have undergone a complex development. Given the right conditions, open water meres may develop into mosses over a period of many thousands of years. Leaf litter from vegetation in and around the mere builds up in a thick layer until the surface is no

longer accessible to the nutrient rich water below. This may be due to the build up of plant material from the bed, or by the development of floating rafts of vegetation. When this happens, the surface of the peat is kept wet mostly by rain and the character of the vegetation changes dramatically in the more acidic conditions. Within these communities, various species of bog moss play an important role. The bog mosses absorb water and continue to build up peat either in the form of a dome or raised bog, or within a hollow to form a basin mire, which although rare in Britain are well represented within this Natural Area. In a very few cases, the water surface is entirely covered by a raft of floating vegetation forming a quaking bog or 'schwingmoor', the twin examples of Abbots Moss and Clarepool Moss being especially fine examples.

Not only do most mosses have a history with glacial origins but also many have changed little and slowly throughout their life and are therefore rare examples of truly ancient vegetation within the modern, agriculturally dominated landscape.

In a similar way to the complex association of habitats seen around meres, mosses also tend to develop successional fringes of wooded vegetation. Fen vegetation is characteristic of the moss margins where nutrient levels are higher. Fen, carr and moss woodland all contribute to the diversity of the moss sites which in turn allows an extensive range of plant and animal species to flourish. In their natural state, the permanent wetness of the Sphagnum lawns prevents colonisation by trees and shrubs. However, most water tables have been lowered by artificial drainage, causing the moss surface to dry and thereby allowing trees to colonise. The shade, leaf litter and additional drying effect of the trees are all damaging influences.

Characteristic species

The very wet, acidic conditions created by peat provide habitat for a variety of particularly specialised species. The ground layer of the mosses is dominated by lawns of bog moss which form the basic component of peat and which generate localised hummocks of varying shades of yellow, green and red depending on the species. Trailing mats of cranberry are also typical. The commonest of Britain's three species of insectivorous sundew occurs within the wetter parts of many mosses and the bobbing white heads of cotton grass are characteristic of the wet hollows. In the drier areas, cross leaved heath and sedges such as white beaked sedge and aromatic bog myrtle are also present. Some mosses contain regionally important breeding pools for an exceptional diversity of invertebrates including dragonflies, butterflies and spiders; for example, 148 species of spider have been recorded from the schwingmoors of Abbots Moss, including the swamp and pool loving, raft spider. The mosses are also important for birds; for example, short-eared owl which visits this country in small numbers each winter and snipe, for which numbers are declining rapidly, most likely due to continuing land drainage. Lesser spotted woodpeckers are associated with the wooded mossland edge - especially areas of birch.

Significant species

The mosses provide habitat for a number of species of national and international significance. Bog rosemary reaches the southern limit of its range in Britain on some of these sites and the specialised conditions allow unusual species of moss and liverwort to flourish. Insects are particularly habitat dependent and species such as the scarce white-faced darter dragonfly which has experienced a significant decline in its British numbers/range in the last 25 years can be found hunting over still or slow moving water. Adders, which are scarce in central

England are significant within this range of habitats and are found in some less disturbed areas such as at Abbots Moss. Nightjar in particular show cause for concern with declining numbers and a nationally recorded retreat from the north and west of their range.

Extinct/declining species

The particularly distinctive and rare conditions prevailing in complex moss habitats sustain a range of declining species of plant and animal. This is strongly reflected in the common names given to some of these species bog sedge, bog orchid (now extinct) and black bog-rush which are found only in scattered locations where there are appropriate conditions. Air pollution and mossland drainage has much reduced the diversity of bog mosses with *Sphagnum magellanicum*, *S. tenellum* and *S. riparum* in this category. Threatened invertebrates may also be found in isolated pockets such as at Fenn's, Whixall, Bettisfield, Wem and Cadney Mosses which is one of only three British locations for a species of caddis fly *Hagenella clathrata* and the southern-most locality in England for the large heath butterfly.

Issues

- Recent series of drought years/long term climate change?
- Lowering of the water table due to on or off site agricultural drainage.
- Reduction of water levels as a result of direct and adjacent abstraction and the widespread lowering of the water table resulting from local mineral extraction, development etc. The impacts of abstraction may affect sites located some distance away.
- Water Level Management Plans have been written for very few sites.
- Succession to birch or conifer woodland leading to enrichment and desiccation.
- Many mosslands have already been damaged by afforestation.
- Bog moss gathering for use in gardening, such as the making of 'moss poles' and hanging baskets.
- Conversion of moss sites to productive agricultural land.
- Potential to restore drained and degraded mossland by re-wetting.
- Unsustainable commercial peat winning which dries surrounding wetlands by lowering the water table.
- General development such as landfill on and off site causes direct habitat loss, lowered water table and increases the potential for pollution.
- Peat bogs are often perceived as worthless, dangerous places into which people, livestock and machinery may sink without trace.

- The public perception that woodland is a preferable habitat.
- The Peatlands Campaign has raised the public awareness of the value of and threats to the mosses and encouraged research into the dynamics of peat bog ecology.
- Nutrient enrichment/pollution from catchment run off and concentration of atmospheric pollution by trees on site.

Objectives

Key Objectives

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To have all sites comprehensively surveyed, described and assessed.*
- *To have in place simple but comprehensive monitoring programmes to gauge any further degradation or improvement of sites.*
- *To restore mossland habitats in sub-optimal condition to optimal condition.*
- *To prevent the isolation or severance of rare communities through strategic, monitored, programmes of habitat restoration and enhancement, which focuses on high biodiversity areas.*
- *To encourage and facilitate the completion of management plans agreed by site users, which will direct management towards the enhancement of key species and communities.*
- *To minimise the direct impact of pollution, enrichment and encroachment from site edges, through the development of buffer zones around all key sites.*
- *To involve site owners and occupiers in whole site management, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

Additional Habitat-specific objectives

- To maintain water tables in peatland systems at appropriate seasonal levels, ideally as set out in a Water Level Management Plan which considers the entire hydrological unit, of which the 'site' might only be a part.

12.3 Swamp

Historically much more extensive than they are today, swamps are most likely to be an important component of the array of vegetation zones around meres and other areas of standing water such as ponds and canals. Within this Natural Area they are characterised by tall grass or sedge stands, dominated by a single species, which grow with at least their roots

in water. Swamp usually occurs where the ground is nutrient rich and can survive even if the water in which it is growing is stagnant. The swamp vegetation is frequently a transitional stage to fen or marshy grassland which can develop in drier areas, when inundation is less permanent. Even when swamp remains wet, invasion by willows and alder initiates the succession to a wet woodland type characteristic of the Natural Area. The most extensive area of swamp, with stands dominated by different species locally, is to be found at Doxey and Tillington Marshes.

Characteristic species

The diversity of plant species associated with swamp vegetation is often poor, with single species stands frequently dominated by reed sweet-grass or lesser pond-sedge only occasionally allowing herbs such as common marsh-bedstraw and the strongly fragrant water mint space to grow. The lesser pond-sedge swamp is not a particularly common community and the Shropshire mere systems are one of the few places outside the Fens and Broads in which it is found. Reed warbler, which nests almost exclusively in common reed, sedge warbler and occasionally water rail are attracted to the dense vegetation in which they are well hidden and can nest. In winter many roosting wildfowl benefit from the shelter offered by their fringing screen. However, reed beds dominated by common reed, so typical of other parts of the country are not so typical of swamps in this natural area, and when encountered are usually limited in extent. Swamps dominated by reedmace are more favoured by snipe and jacksnipe in winter, once they have died down. The accumulation of rotting vegetation under stands of swamp vegetation, and the abundant shelter amongst the plants, provides refuges for many aquatic invertebrates.

Significant species

Teal make use of lowland swamps to overwinter after breeding in wet moorland areas.

Extinct/declining species

Swamps offer shelter for a variety of waterfowl, waders and warblers many of which are becoming uncommon. Bitterns are occasionally seen in winter (a breeding species until the 19th century).

Issues

- Enrichment of the water due to fertiliser run-off from surrounding farmland.
- Reduction of water levels as a result of direct and adjacent abstraction and the lowering of the water table from local mineral extraction, development etc.
- Recreational activities such as angling and motor sports may lead to the disturbance of sediments, damage to vegetation, pollution and direct disturbance to sensitive species.
- Pollution of water may occur from spills on adjacent farmland, or from the use of power driven boats.
- Grazing of reedbeds by geese severely restricts their extent.

- Spread of New Zealand stonecrop.

Objectives

Key Objectives

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To seek opportunities to extend the existing resource, utilising especially the funds available via agri-environment and other countryside enhancement schemes.*
- *To have all sites identified, comprehensively surveyed, described and assessed.*
- *To have in place practicable monitoring programmes to gauge any further degradation or improvement of natural features.*
- *To restore swamp habitats in sub-optimal condition to optimal condition.*
- *To prevent the isolation or severance of rare communities through strategic, monitored programmes of habitat creation and enhancement, which focuses on high biodiversity areas.*
- *To encourage and facilitate the completion of management plans agreed by land users, which will direct management towards the enhancement of key species and communities.*
- *To minimise the direct impact of pollution, enrichment and encroachment from site edges through the development of buffer zones around all key sites.*
- *To involve owners and occupiers in the management of sites as part of their wider surroundings, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

12.4 Fen & fen grassland

Any attempt to try to separate the different elements of the hydrosere, from open water through to damp terrestrial habitats, is an extremely arbitrary process for each element merges seamlessly to the next, and any species associated with one habitat is likely to be dependent on adjacent habitats as well.

Grouped together here are the series of wetland types, very frequently associated with the mere basins, which develop where there is an ample supply of nutrients, and the waterlogging is permanent or seasonal. Swamp, often dominated by one or two species, occupies the shallow margins of many meres and ponds, but as the dead remains of plants builds up, a wider range of plants is able to colonise the peaty surface. This is fen; eventually a rich mix of wetland plants that many might call marsh or mire. Not only is fen botanically diverse, it also supports a diverse assemblage of invertebrates, especially the insect groups, beetles, flies, butterflies and moths.

Fen itself is a broad category, including at one extreme 'tall fen', dominated by tall herbs such as branched bur-reed, hairy willow herb, sedges and rushes, often forming in situations where fresh nutrients are brought in by a slow flow of ground water from the surrounding catchment. At the other extreme, where there is less influence of ground water, and water movement is largely up and down and rainfall is the predominant supply, a shorter, moss and sedge dominated, 'poor fen' develops. From here it is easy to see the close connection with the moss dominated vegetation of many of the nutrient-poor sandy basins.

Wherever areas of fen are accessible, at least seasonally, traditional agricultural management by grazing or hay making has maintained species-rich fen grassland. This habitat has frequently developed around meres and mosses, with particularly fine examples in the extensive peaty zone around Aqualate Mere. These fens and grasslands are extremely species-rich in both plants and insects including many rare and declining species.

Botanical diversity declines as the shading affect of colonising woody species, such as willow, birch and alder increases. Such fen carr is an important refuge for many species of fly, from daddy longlegs to the smallest midge.

Characteristic species

To fully describe the characteristic plant species of fen and fen meadows could take many pages of this report. All the types of fen have different and diverse communities of plants, notably their mosses and liverworts, grasses, sedges and rushes, and a vast array of flowery herbs. (A selected list can be found in the 'Habitat Summary' appended to the report.) Although fens and fen grasslands have always been important for feeding and nesting waders, many of these species are in decline and mentioned below. Among the many species of smaller birds using these wetlands, reed bunting and yellow wagtail are typical.

Significant species

Among the more significant species which may be found in this habitat are a wide range of orchid species including early, southern and northern marsh orchids, heath spotted orchid and twayblade. Marsh fern which usually grows shaded by taller plants and which is decreasing in its distribution can be found as can blunt-flowered rush which is locally frequent and meadow thistle which has a local distribution in England. Again the full list of significant species is long; a selection can be found in the 'Habitat Summary' appendix.

Extinct/declining species

The direct loss and degradation of fen habitats as a result of the issues listed below accounts for much of the decline in the many dependent species.

Within the fen meadow habitats green-winged orchid, which tolerates a degree of light grazing and summer mowing, is decreasing rapidly due to agricultural improvements. The barn owl, which prefers to hunt over open areas for voles is declining nationally, due to the destruction of traditional breeding and feeding sites, urbanisation, use of toxic pesticides and disturbance. Other species in decline are lapwing, snipe and redshank, the latter two dependant on wetlands. Redshank in particular has declined as a breeding species' in Britain by 25% over the last 20 years.

Issues

- Agricultural improvement is further reducing and fragmenting the already diminished resource by drainage or more intensive management.
- Artificially enhanced nutrient levels from agricultural fertilisers and other sources.
- Maintaining appropriate water levels may cause flooding on adjacent intensively farmed land.
- Reduction of water levels as a result of direct and adjacent abstraction and the lowering of the water table from local mineral extraction, development etc.
- Conversion of hay to silage will change the timing and frequency of cutting to the detriment of many species.
- Management regimes may result in over or under grazing the sward which will lead to the loss of species which are too tightly cropped, or over-shadowed by more competitive species.
- Changes in stock type held by graziers has lead to inappropriate animals being used to graze highly sensitive wet grasslands.
- Afforestation will lead to the direct loss of habitat and the drying out of adjacent land due to increased water uptake.
- Creation of ponds in what is often considered by landowners to be suitable locations in wetland areas will result in the loss of this resource
- Agri-environment schemes such as Countryside Stewardship offers funds to conserve, restore and recreate fen grasslands.

Objectives

Key Objectives

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To seek opportunities to extend the existing resource, utilising especially the funds available via agri-environment and other countryside enhancement schemes.*
- *To have all sites identified, comprehensively surveyed, described and assessed.*
- *To have in place practicable monitoring programmes to gauge any further degradation or improvement of natural features.*
- *To restore fen and grassland habitats in sub-optimal condition to optimal condition.*

- *To prevent the isolation or severance of rare communities through strategic, monitored programmes of habitat creation and enhancement, which focuses on high biodiversity areas.*
- *To encourage and facilitate the completion of management plans agreed by land users, which will direct management towards the enhancement of key species and communities.*
- *To minimise the direct impact of pollution, enrichment and encroachment from site edges through the development of buffer zones around all key sites.*
- *To involve owners and occupiers in the management of sites as part of their wider surroundings, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

Additional Habitat-specific objectives

- To extend areas around existing wetlands to allow for successional natural habitat creation.

12.5 Woodland

Over Cheshire in particular the agricultural capability of flat fertile soils lead to widespread woodland clearance. Sheltered cloughs and windswept sandstone ridges retain contrasting areas of ancient woodland.

Clough Woodland

These woodlands have developed on steep valley sides formed as streams and rivers cut through the soft glacial deposits. The steepness of the slopes has meant that the valleys are unsuitable for agriculture or woodland management and so woodland which is usually ancient in origin has remained, in a comparatively undisturbed state. The upper slopes of the cloughs usually have leached acidic soils from the uppermost glacial deposits, whilst the lower slopes cut through the underlying Keuper Marl and are more base rich. This increases the variation down the clough slopes with many fine examples of such woodland to be found in Cheshire in the incised river valleys of the Rivers Bollin, Dane and Weaver and their tributaries.

Characteristic species

Leached soils at the top of cloughs typically have a canopy of oak over brambles, bluebells and perhaps bracken. More base-rich soils on the clough sides are indicated by an increase in dog's mercury, yellow archangel and herb Robert, while oak declines in the canopy to be replaced by ash, sycamore, wild cherry and elm. In a few woods small-leaved lime or wild service tree occur. Hazel may be abundant as derelict coppice in the understorey. Seasonally waterlogged soils at the foot of slopes support alder with opposite-leaved golden saxifrage and yellow pimpernel beside rivulets or brooks. Crack willows and nettles characterise more generally waterlogged areas.

Marsh tits are very characteristic of ash/maple woodlands in the natural area. They formerly occurred in other mature woodland types, but have retreated from many of these in recent years.

Significant species

Species of interest include many plant species which are largely restricted, within the Natural Area to exposures of more calcareous soils in old woodlands, eg early purple orchid, hard and soft shield ferns, herb Paris and giant bellflower. Many invertebrate and fungus species are also restricted to wooded cloughs.

Sandstone Ridge Woods

In sharp contrast to the cloughs, which sit below the level of the plain, the sandstone ridges are elevated, but because of their poor soils, are similarly well endowed with woodland habitats. Steeper slopes are frequently ancient in origin, having been continuously wooded. Other wooded areas are often much younger, having developed naturally from neglected heathland or grassland. Significant areas have been 'coniferised'. The free draining soils mean there are seldom any wet areas.

Characteristic species

The acidic soils found on the sandstone ridges of the plain typically do not support the same plant diversity as do the calcareous clough woods. Oak, if it was not cleared during the Second World War, is invariably the dominant tree with the more natural woods supporting both English and sessile types. Birch and rowan are virtually always in support with Holly often being the only other tree or shrub. The ground flora too is species-poor, with wavy hair-grass, soft grass, or bracken being frequent dominants.

Significant species

Very few significant plant species are known from these woods and their dry exposed nature is not conducive to luxuriant moss and lichen growth. Common cow-wheat however is one exception, for it is not found as its name would suggest. Birds are better represented, with several uncommon breeding species attracted to the elevated position and holey trees: buzzard, sparrowhawk, raven and pied flycatcher for example. Where dead and fallen timber is not removed, a diversity of uncommon insects are supported, especially beetles. Thus, as the botanical diversity decreases with antiquity, there is a comparative increase in the invertebrate army of decomposers.

Issues

- Grazing of unfenced woodland encourages grass dominance at the expense of ground flora diversity. Woodland regeneration is prevented with resultant loss of age structure and shrub layer.
- Elm die-back from Dutch elm disease has led to a great increase in bramble at the expense of a more diverse field layer.
- Use of woodlands for pheasant rearing damages the ground flora.

- An increase in sycamore dominance reduces ground flora diversity and the regrowth of other woody species due to its dense shade and the mulching effect of its leaves.
- Removal of dead wood and premature felling of old trees significantly reduces essential refugia for specialised insects.
- A decline in woodland management often reduces the variety of woodland structure.
- Excessive sycamore clearance, especially where there has also been loss of elm, leads to dominance by bramble.
- Conversion to conifers and use of foreign seed stock reduces the naturalness of managed woodland.
- The juxtaposition of species-rich grasslands and ancient woodlands on steep slopes provides complementary sets of conditions vital to some “ancient woodland” invertebrates such as hoverflies.

Objectives

Key Objectives

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To seek opportunities to extend the woodland zone adjacent to the existing resource, utilising especially the funds available via agri-environment and the Woodland Grant Scheme.*
- *To have all sites identified, comprehensively surveyed, described and assessed.*
- *To have in place practicable monitoring programmes to gauge any further degradation or improvement of natural features.*
- *To restore ancient semi-natural habitats in sub-optimal condition to optimal condition.*
- *To prevent the isolation or severance of rare communities through strategic, monitored programmes of habitat creation and enhancement, which focuses on high biodiversity areas.*
- *To encourage and facilitate the completion of management plans agreed by land users, which will direct management towards the enhancement of key species and communities.*
- *To minimise the direct impact of pollution, enrichment and encroachment from site edges through the development of buffer zones around all key sites.*

- *To involve owners and occupiers in the management of sites as part of their wider surroundings, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

Additional Habitat-specific objectives

- To maintain the naturalness of ancient woodland by using native species and seed of local provenance in all replanting schemes.
- To increase the awareness of forest managers of the benefits to wildlife of dead wood and economically over mature trees.
- To re-establish traditional management where techniques such as coppicing are no longer practised.
- To persuade game managers to use less sensitive secondary woodland for pheasant rearing.
- To reduce the dominance of sycamore at ancient woodland sites, where it has become established or been planted.
- To avoid species-rich grasslands in the vicinity of woods when targeting planting areas.

12.6 Heathland

A number of comparatively small relict areas of lowland heathland survive within the Natural Area. Their distribution is directly linked to the pattern of sandy outwash and Triassic sandstone ridges within the plain. Both dry and wet heath types occur; dry heath often associated with areas of sandy grassland and wet heath predominantly where underlying boulder clay impedes drainage through the sandy surface and is often associated with mire communities, especially where sand pits have been dug, and are typified by lenses of peat in their soil profile. Heathland is an internationally scarce habitat which can support a range of rare and unusual plants and animals. Unmanaged, both types of heath typically become degenerate or 'leggy'. Recently many of these relict areas have been brought back into active management. On a great proportion of heathland sites however, with the invasion of trees and shrubs, there has been succession to full canopy oak birch woodland. This advanced state of succession is often impracticable or publicly unacceptable to restore to heath.

Characteristic species

The vegetation of the lowland heaths is typically dominated by heather growing on acid to neutral, freely draining poor soils. Other species most often found in association are gorse and bell heather which may form a varied mosaic of purples and greens. Where the heather growth is more open, bilberry may occur. Sites with heathland areas often grade into sphagnum bog and birch/oak woodland for example at Little Budworth Common SSSI. These sites clearly provide strong visual demonstrations of the dynamic processes of succession. Some insect species are particularly associated with heathland such as the green tiger beetle which is mainly found on light well drained soil where they make burrows to await their prey. Green hairstreak butterfly larvae, like many invertebrates, are dependent upon specific

food plants; in this case bilberry and gorse. Amongst the heathland plants grass snakes and lizards are found because they favour relatively undisturbed, low shrub habitats into which they can easily ‘disappear’, from the open, sunny basking areas.

Significant species

Significant species of plant which occur within heathland communities, include round-leaved sundew which grows in the wetter areas of Sound Heath SSSI. Bird’s-foot can be found on dry heaths: this tiny legume is locally common in much of the British Isles and prefers sandy ground. There are also a number of significant species of insect associated with heathland habitats, these include the beautiful snout moth, the larvae of which feed on bilberry and alder kitten moth which has a southern distribution and lays its eggs on birch and alder.

Extinct/declining species

Both dry and wet heaths are valuable habitats for important assemblages of insects. The distinctive features of heathland habitats and their inherently transient nature are crucial for some species including common and small cudweed, trailing St John’s-wort and petty whin which all grow in places where there are dry, sandy soils. Other species such as royal fern or the uncommon deer-grass at Hodnet Heath SSSI occur within the wetter areas. Birds such as nightjar and tree pipit have been severely affected by the decline in extent and, quality of heathlands.

Declining species such as the silver-studded blue butterfly which has its last surviving Midlands colony on Prees Heath are highly dependent upon specific habitat requirements. This butterfly is presently being monitored for a species re-introduction programme in the Wirral, as there is not a more suitable site in this Natural Area.

Issues

- Encroachment of dominating species such as bracken, rhododendron, wavy hair-grass and purple moor-grass, prevents the growth of less competitive heathland species.
- Atmospheric Nitrogen deposition.
- Decline in sustainable traditional management practices allows succession to woodland and further loss of an already much diminished habitat resource.
- Recreational pressure causes wear to the fragile structure of the heath.
- Common Land may be under or over grazed and it is often difficult to secure agreements to control stock by fencing.
- Extinction of species may occur due to loss of habitat or collection, especially of butterflies.
- The small size and isolation of sites may lead to stagnation of genetic variation within species, and hence the viability of populations of plants and animals.

- A falling water table due to surrounding drainage, abstraction or development leads to the loss wet heath.
- The giving of oral pesticides to stock affects the populations of dung feeding invertebrates.
- A public perception that trees are always a preferred habitat type, affects the response to suggested tree removal to preserve heathland environments.
- Countryside Stewardship can focus funds for the re-creation and management of heathland into areas where this habitat was formerly more extensive.
- Conifer plantations cover much former heathland.

Objectives

Key Objectives

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To seek opportunities to extend the existing resource, utilising especially the funds available via agri-environment and other countryside enhancement schemes.*
- *To have all sites identified, comprehensively surveyed, described and assessed.*
- *To have in place practicable monitoring programmes to gauge any further degradation or improvement of natural features.*
- *To restore heathland habitats in sub-optimal condition to optimal condition.*
- *To prevent the isolation or severance of rare communities through strategic, monitored programmes of habitat creation and enhancement, which focuses on high biodiversity areas.*
- *To encourage and facilitate the completion of management plans agreed by land users, which will direct management towards the enhancement of key species and communities.*
- *To minimise the direct impact of pollution, enrichment and encroachment from site edges through the development of buffer zones around all key sites.*
- *To involve owners and occupiers in the management of sites as part of their wider surroundings, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

Additional Habitat-specific objectives

- To manage recreation activities within sustainable levels.

- To further raise the profile of lowland heath as a declining nature conservation resource.
- To actively promote and explain the need to clear apparently good trees from remaining heathland fragments.
- To ensure that tree planting schemes are not targeted at heathland sites.
- To seek where possible, unobtrusive fencing to enable grazing management especially where traditional burning can no longer be used to maintain heathland communities.
- To specifically target restoration of mineral workings in sandy areas to heathland.

12.7 Grassland

The Natural Area no longer contains extensive areas of agriculturally unimproved grassland because the area's soils have been so amenable to intensified use. Fortunately, a number of valuable examples of once extensive types have survived. Four distinct categories of ancient grassland are found:

- (i) on clough slopes, often influenced by calcareous clays and with damp spring-fed areas, moderately species rich. Small sites are scattered across Cheshire along the sides of most river valleys;
- (ii) on the plain's better soils, a neutral pasture or hay meadow type now virtually lost from the landscape, for example at Meverley Farm SSSI on the Shropshire/Cheshire border;
- (iii) flood plain meadows and pastures typified by greater burnet found at Motte Meadows NNR;
- (iv) a more acidic type of pasture on leached sandy soils, often rich in grassland fungi.

Characteristic species

- (i) Clough grasslands have been maintained on the more gentle, grazable slopes of the incised valleys throughout Cheshire; very few other types of unimproved grassland have survived. Stock have controlled the development of hawthorn scrub and apart from manuring, fertiliser application has not been economical. The result is an extremely diverse grassland reflecting its underlying calcareous boulder clay, acidic sandy crests or damp flushed areas. Knapweed, betony, devil's-bit scabious and the grasses, crested dog's-tail and meadow fescue are frequently encountered. Where the lime influence of boulder clay is stronger, cowslip and quaking grass are more common, and on the leached upper banks the more acidic soils are shown by tormentil and heath bedstraw.
- (ii) There remain a number of examples of fen grassland on peaty soils across the Plain, but agriculturally unimproved grazing and hay meadows on mineral soils are extremely rare on the open Plain. Typically they are similar to the neutral areas in the

cloughs, but ridge and furrow has been used to improve their drainage where it is impeded by underlying clay. Rushy hollows alternating with free draining ridges would once have been the usual appearance of pasture land throughout the Natural Area. On better soils, lush pasture or hay meadows could be sustained. The surviving farm of unimproved neutral grassland at Molverley also has a mature hedgerow system once much more typical of the Plain.

- (iii) Perhaps the rarest type of unimproved grassland is the flood plain meadow. Characterised by the presence of greater burnet, meadow vetchling and meadow foxtail grass, such flat, fertile, riverside areas were frequently cropped late for hay or grazed. The National Nature Reserve at Motte Meadows is one surviving cluster of fields, and one needs to travel to the Welsh side of the River Dee south of Chester to find another good example.
- (iv) Sandy soils are found scattered across the Plain and associated with the sandstone ridges. They support acidic grassland dominated by fine leaved fescue and bent grasses or mat-grass with only a few herbs such as sheep's sorrel, heath bedstraw and devil's bit scabious. In contrast to their low botanical diversity, such grasslands often possess a varied selection of fungi including many species of colourful wax caps.

Significant species

- (i) Within the cloughs, less common plants would include spiny nest-harrow, lady's mantle and pepper saxifrage.
- (ii) The diminutive adder's tongue fern still survives in a few old pastures, preferring the drier areas of short cropped ridge and furrow.
- (iii) Most significant by far is the show of snake's head fritillaries in May at Motte Meadows.

Extinct/declining species

Unimproved grassland habitats are particularly difficult to sustain by modern farming practices. They are prone to neglect or unsustainable grazing, and are still being lost to fertiliser, herbicide, plough, drain or developer's bulldozer. As such, the entire resource is in decline, and all its dependant species. Open farmland is still losing many of its rare (and familiar) species. Examples in the very long list would include the plants saw-wort (one site in Cheshire), green-winged orchid (extinct) and greater butterfly orchid (extinct?), together with breeding birds in decline such as snipe, barn owl and grey partridge.

Issues

- Agricultural intensification by cultivation and the use of fertilisers, pesticides and herbicides destroys the fine balance of the meadows and allows more aggressive species of grass to dominate.
- Conversion from pasture to silage cropping.

- Changes in agricultural practice, such as altered mowing regimes will affect the composition of the sward by cutting before some species have had the chance to set seed. Disposal of farm animal wastes in the farm in the form of slurry rather than as traditional farmyard manure introduces weeds such as dock.
- Ploughing and levelling of ridge and furrow has removed the strips of rush pasture which were once characteristic of the furrows. Snipe and lapwing formerly nested on the drier ground and led their chicks to the rush pasture to feed in cover. These species also visited in larger numbers in winter.
- Use of oral medicines to control gut parasites in grazing animals is detrimental to non-target invertebrates in the grassland and grassland fungi.
- Changing farm subsidies have made grazing of inaccessible grassland uneconomical, allowing invasion of scrub and loss of diversity.
- Schemes to enhance areas for wildlife often involve tree planting, which is inappropriately targeted at less productive, species rich grassland sites.
- Successive years of drought have caused springs to dry up. With insufficient food available on parched swards, grazing has concentrated on flushed areas with resultant trampling and overgrazing damage.
- Farmers may no longer possess appropriate stock to graze ancient pasture. Horses and sheep are now grazing where dairy or beef cattle did formerly, causing adverse changes to the sward.

Objectives

Key Objectives

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To seek opportunities to extend the existing resource, utilising especially the funds available via agri-environment and other countryside enhancement schemes.*
- *To have all sites identified, comprehensively surveyed, described and assessed.*
- *To have in place practicable monitoring programmes to gauge any further degradation or improvement of natural features.*
- *To restore semi-natural habitats in sub-optimal condition to optimal condition.*
- *To prevent the isolation or severance of rare communities through strategic, monitored programmes of habitat creation and enhancement, which focuses on high biodiversity areas.*

- *To encourage and facilitate the completion of management plans agreed by land users, which will direct management towards the enhancement of key species and communities.*
- *To minimise the direct impact of pollution, enrichment and encroachment from site edges through the development of buffer zones around all key sites.*
- *To involve owners and occupiers in the management of sites as part of their wider surroundings, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

Additional Habitat-specific objectives

- To ensure that agri-environment subsidies such as Countryside Stewardship continue to be targeted towards sustaining existing unimproved grassland sites as an irreplaceable part of one of the most seriously diminished resources in the Natural Area.

12.8 Flood plains

The Natural Area contains several significant flood plains. Its flat low lying basins carry meandering stages of ten main rivers including the Dee, Dane, Severn, and Sow. The first three have sections notified as SSSIs for their geomorphological qualities while the Doxey and Tillington Marshes SSSI, on the Sow near Stafford, highlights the value of the flood plains many wetland habitats to birds and insects in particular. Most are developed on silty alluvium, but others such as the Sow and Gowy have formed extensive areas of peat and are very rich botanically. Indeed all flood plains retain many relics of semi-natural vegetation and as such, form extensive wildlife corridors of high biodiversity. Descriptions of the key nature conservation habitats and species occurring within flood plains, grassland, fen, swamp and ponds, can be found in their own sections of this report. The species description paragraphs which follow concentrate on other important species dependent on the flood plain environment.

Significant species

Fine specimens of our native black poplar, which was formerly extensively propagated by cuttings, are still to be found scattered across the Natural Area particularly in the Dee flood plain. The club-tailed dragonfly, cray fish, kingfisher and otter depend on unpolluted river water, while duck such as teal, pintail and wigeon feed in the riverside pastures.

Extinct and declining species

The white-fronted goose has been lost from the area and the ditch- side meadow rue is now only rarely found.

Fish, including the gwyniad, smelt and shad are not caught these days, and the stone loach has declined.

Issues

- Flood defence carried out using major river engineering significantly reduces biodiversity.
- Stock can accelerate the erosion of river banks if grazing is not adequately controlled.
- The Environment Agency Local Environment Action Plans detail valuable habitat creation targets for flood plain restoration.
- Their potential as buffer zones to reduce nitrate pollution of rivers would also create habitats valuable to wildlife.
- Flood plain forests threaten their traditionally open landscape quality.
- If climate change puts greater stress on water resources, there is potential to increase their storage capacity.

Objectives

Key Objectives

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To seek opportunities to enhance the existing resource, utilising especially the funds available via agri-environment and other countryside enhancement schemes.*
- *To have in place practicable monitoring programmes to gauge any further degradation or improvement of natural features.*
- *To restore semi-natural habitats in sub-optimal condition to optimal condition.*
- *To prevent the isolation or severance of rare communities through strategic, monitored programmes of habitat creation and enhancement, which focuses on high biodiversity areas.*
- *To encourage and facilitate the completion of management plans agreed by land users, which will direct management towards the enhancement of key species and communities.*
- *To involve owners and occupiers in the management of sites as part of their wider surroundings, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

12.9 Ponds

From ancient times until the 19th century it was the practice to spread calcareous marl onto farmland, or to create agricultural soils by adding clay to sand. This led to the formation of thousands of marl-pits, many of which filled with water due to the underlying boulder clay and were colonised by a rich variety of aquatic plants and animals. As a result of this

practice, nearly 10-15% of all ponds in England and Wales are found within the Meres and Mosses Natural Area. Ponds were also created where sand has been dug, often on wet heathy commons such as at Sound, well known for its rare invertebrates. The number of ponds also provides important stepping stone links between the larger meres within an otherwise intensively farmed landscape. Higher insect numbers associated with these water features attract foraging bats.

Characteristic species

An important feature of the species within these ponds is the chance element of their flora. First arrivals reflect the presence of local seed sources. There is a big and constant difference between newly dug or dredged ponds and old established ponds, with a decline in base status with age. This is reflected in the succession of both plants and invertebrates. Late succession plants include marsh pennywort, marsh cinquefoil and the bog moss *Sphagnum squarrosum*.

The marl pits typically support a good range of common aquatic plants such as water-plantain, tubular water-dropwort and nodding bur-marigold, an annual which often colonises the extensive areas of bare mud which may be exposed on pond margins in summer. Characteristic swamp species include great reedmace, branched bur-reed, water horsetail, common spikerush and tufted forget-me-not. Submerged aquatics are now infrequent because of algal filming, but species with floating leaves remain typical - duckweed, floating pondweed. Most marl-pits have a narrow fringe of rush-pasture vegetation with Yorkshire fog, soft rush, hard rush, creeping bent, and creeping buttercup.

Newly dug ponds have stoneworts, certain *Haliphus* beetles, dragonflies such as emperor dragonfly and broad-bodied chaser. There is a wide range of common invertebrates associated with mid-succession ponds. Late succession ponds often contain nationally scarce invertebrates. Commonly found among the wealth of invertebrates attracted to the margins of these oases is the southern red-eyed damselfly.

Significant species

Marl pits provide a suitable refuge for amphibians particularly great crested newt which is widely distributed throughout the Natural Area, even locally common, but is declining throughout the British Isles making this area an important stronghold in a British and a European context. Small water bodies such as marl pits are important for newts, as they may almost dry out in summer thus eliminating fish which are critical predators of newt eggs and efts. Cowbane, a nationally rare plant, poisonous to cattle, is found only occasionally. Water beetles, many of which are nationally Notable species, are associated with mature ponds. Brackish-water communities support the large water beetle and the aquatic plant lesser hornwort. *Ricciocarpus natans* is a nationally uncommon liverwort at the edge of its range in the Natural Area.

Extinct/declining species

The decline in open water and wetland habitats is reflected in a decline of many of the species that they support. The floating frogbit may be locally frequent nationally, but is only known from a few sites within the Natural Area. When milfoil is found, it is usually introduced, as is water-violet. Many rush-pasture species once typical of pond margins are in decline, eg ragged robin and lesser spearwort. Seasonal and fluctuating ponds are under

threat from falling water-tables, in-filling, and “restoration”. Many associated species include lesser silver water beetle, surviving in only a few ponds with floating grasses hundreds of miles from its Somerset “stronghold”, the mud snail and once common snails such as moss bladder snail and button ramshorn.

Issues

- The infilling of ponds by farmers to increase their area of production and accessibility for machinery, or simply as a dump for farm rubbish.
- The pond resource needs rejuvenation, but may be better achieved by the digging of new ponds rather than by restoring late succession ponds which often support rare invertebrates.
- Enrichment and pollution of the water due to the run-off of fertilisers and pesticides used on surrounding farmland.
- Reduction of water levels as a result of direct and adjacent abstraction and the lowering of the water table from local mineral extraction, agricultural drainage, development etc.
- Pond margins are often targeted for tree planting.
- Overshading by trees leading to a loss of species due to lack of light and the gradual infilling of pool from leaf debris.
- Shaded ponds may provide the only tall scrub on a farm as habitat for birds.
- European funding through 'Life' for a pond demonstration project and the raising of awareness in rural communities of the importance of ponds.
- An improper understanding amongst conservationists of the importance of ponds in all successional stages is allowing damaging restoration management to proceed.

Objectives

Key Objectives

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To seek opportunities to extend the existing resource, utilising especially the funds available via agri-environment and other countryside enhancement schemes.*
- *To have in place practicable monitoring programmes to gauge any further degradation or improvement of natural features.*
- *To encourage and facilitate the completion of management plans agreed by land users, which will direct management towards the enhancement of key species and communities.*

- *To minimise the direct impact of pollution, enrichment and encroachment from site edges through the development of buffer zones around all key sites.*
- *To involve owners and occupiers in the management of sites as part of their wider surroundings, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

Additional Habitat-specific objectives

- To work towards a restoration of the former pond distribution and density.
- To urgently pursue the survey of the pond resource to identify key ponds and pond clusters.
- To adequately survey any pond prior to restoration management to ensure that rare species dependant on late-successional stages are not inadvertently lost.
- To ensure that unavoidable pond loss arising from development is mitigated by pond creation on a two for one basis.
- To only consider translocation of great crested newt populations when there is no way to retain their population and associated terrestrial habitat within the development site.

12.10 Subsidence flashes and inland salt-marsh

During the Triassic period 195 - 225 million years ago, much of the Meres and Mosses area was covered by a shallow marine lagoon connected to the Irish sea, and as these waters rapidly evaporated in the warmer climate of the time, a thick layer of salt was deposited, which is now covered by many layers of sandstone, followed by glacial sands and clay. The presence of this salt layer prompted the development of industries which extracted the salt around the central Cheshire area. The flashes have resulted from the collapse of underground caverns formed when rock-salt was pumped out in the form of brine, accelerating the natural process. Because some flashes are saline, they have features which most closely resemble coastal salt-marsh or damp dune slack communities, such as in Sandbach Flashes SSSI at Watch Lane Flash. This site is recognised in international literature because of the exceptional rarity of such saline communities in inland locations. It is not certain whether the saline sources at Sandbach are directly from salt bearing rock or from residues of now defunct industrial activity. Another series of subsidence flashes has formed along the River Weaver south of Winsford. Although there are no saline waters, these shallow wetlands have extensive swamp and fen vegetation and attract many waterfowl. Other subsidence areas around Northwich, Middlewich and Winsford have largely been reclaimed in earlier industrial times for use as waste lagoons. Saline springs are indicated widely on earlier maps of Cheshire. The last extensive, natural salt-marsh in this Natural Area was lost to a flood alleviation scheme near Nantwich in the 1960's.

Characteristic Species

There is a range of unusual associations found within the flashes communities due to their differing ages, depths and degree of salinity. Amongst the more specialist plant species

which may be found are lesser sea-spurrey and reflexed salt-marsh-grass which are locally frequent and found where there are saline areas. Sea aster and glasswort are also frequent. All are typical plants of coastal salt-marshes.

Significant Species

The flashes are significant for the range of brackish water invertebrates, freshwater invertebrates and migrant waders that they support. Examples of specialist invertebrates include the shrimps *Gammarus duebeni*, which usually requires a tidal influence and *G. tigrinus* which is found in brackish water, the large water beetle *Dytiscus circumflexus* which is scarce even in brackish ponds and two species of water boatmen which are also found in brackish water. The rare shore-weed is also found near Winsford Flashes, where the shallow water and muddy margins regularly attracts wildfowl and waders including widgeon, teal, lapwing, snipe and curlew in exceptional numbers.

Issues

- Declining salinity which will change the composition of the species.
- Increased pressure for these extensive hollows to be landfilled.
- Pressure to 'reclaim' saline areas of industrial origin as part of derelict land schemes.
- Anglers can change the ecosystem of water bodies by the introduction of new species. There are also direct impacts from recreation on bankside vegetation and disturbance of sensitive species such as roosting waders.
- Flashes have frequently developed along water courses. Rapid siltation is reducing the extent of surface water enabling their infilled depressions to be reclaimed into the surrounding agricultural land use.

Objectives

Key Objectives

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To have all sites identified, comprehensively surveyed, described and assessed.*
- *To have in place practicable monitoring programmes to gauge any further degradation or improvement of natural features.*
- *To restore semi-natural habitats in sub-optimal condition to optimal condition.*
- *To prevent the isolation or severance of rare communities through strategic, monitored programmes of habitat creation and enhancement, which focuses on high biodiversity areas.*

- *To encourage and facilitate the completion of management plans agreed by land users, which will direct management towards the enhancement of key species and communities.*
- *To minimise the direct impact of pollution, enrichment and encroachment from site edges through the development of buffer zones around all key sites.*
- *To involve owners and occupiers in the management of sites as part of their wider surroundings, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

Additional Habitat-specific objectives

- To limit recreational use of more sensitive/valuable sites to sustainable levels.
- To identify more accurately the sources of salinity and monitor former salt springs for restored salinity following cessation of brine pumping.
- To retain flashes and salt-marshes within derelict land reclamation schemes.

12.11 Canals

Canals within the Natural Area which are regularly used by boats and barges are usually highly maintained and disturbed by the passage of boats. There is therefore little chance for the development of any significant wildlife interest. However once abandoned, a canal can become an exceptionally rich habitat for aquatic plants and invertebrates. Snails are often well represented, deriving the calcium they need for their shell from clays used to puddle the canal bed. Ferns, lichens and invertebrates are associated with stonework features and bats particularly with tunnels, while towpath grasslands are important reservoirs of plant and insect diversity. There are three sections of canal with SSSI status within the south of the Meres and Mosses Natural Area: these are parts of the Montgomery Canal, Newport Canal and Prees Branch Canal. There is often a small but measurable flow along the waterway and the water levels are reasonably constant throughout the year. Once dredging has ceased a gentle depth gradient can become established encouraging the growth of emergent plants along banks once scraped clean. Some old canals have lost their interest through heavy grazing, pollution or water loss, and the reduction in management may allow trees and reedbeds to shade out aquatic plants. Canals provide foraging habitat for bats, particularly Daubenton's, due to the increased insect numbers along water courses and features such as brick bridges and tunnels which provide valuable roosting sites.

Characteristic species

The sections of canal that are now not navigated often have a substantial range of aquatic plants and invertebrates. Yellow iris and flowering rush may form colourful margins, with a variety of strictly aquatic plants such as pondweeds and rigid hornwort. These margins will be quartered for food and defended by brightly coloured, dragonflies and damselflies such as the metallic blue and green banded and beautiful demoiselles.

Significant species

Some sections of canal support significant species of aquatic plant such as the uncommon frog bit, which will be free floating on the surface of the water, narrow-leaved water-plantain which emerges with a show of delicate pink flowers, and fringed water-lily which although a native of East Anglia is probably introduced here. The green club-tailed dragonfly is more usually found in the south of the country and like many dragonfly species, the nymphs are voracious hunters and spend the greater part of their life cycle lurking in the mud of slow moving water courses.

Extinct/declining species

Floating water-plantain has a very restricted distribution and is protected by British and European wildlife legislation. It is a plant very much associated with canals and may have been spread via these waterways. Its former range has been much reduced recently, possibly as a result of increasing pleasure craft use. It is still found at three locations within the Natural Area including the Montgomery Canal.

Issues

- As boating becomes more popular there is increased pressure to make quieter stretches of canals navigable.
- A change in attitude that potential mitigation of losses, following restoration of navigation, may not be achieved through the excavation of still water, 'off-line' reserves next to canals which have a slow flow.
- Sheet piling of towpath bank prevents the development of soft edges.
- Cleaning of canal stonework.
- Maintenance of tunnels disturbs bats.
- Development of marinas and mooring facilities.
- As canals are unnatural, man-made water courses, the canal fabric needs to be regularly maintained as leaks and severance from recharge sources will lead to the loss of water. Such maintenance while benefitting a few ephemeral plants may be damaging to established perennials.
- Siltation will inevitably lead to succession and the loss of open water habitats.
- The dredging regime of navigable sections of canal removes plants and the larval stages of many insects and canal side wetlands are often damaged when dredgings are dumped.
- Turbidity is the most significant form of pollution.

Objectives

Key Objectives

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To have all sites identified, comprehensively surveyed, described and assessed.*
- *To have in place practicable monitoring programmes to gauge any further degradation or improvement of natural features.*
- *To restore canal habitats in sub-optimal condition to optimal condition.*
- *To prevent the isolation or severance of rare communities through strategic, monitored programmes of habitat creation and enhancement, which focuses on high biodiversity areas.*
- *To encourage and facilitate the completion of management plans agreed by land users, which will direct management towards the enhancement of key species and communities.*
- *To minimise the direct impact of pollution, enrichment and encroachment from site edges through the development of buffer zones around all key sites.*
- *To involve owners and occupiers in the management of sites as part of their wider surroundings, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

Additional Habitat-specific objectives

- To work towards a rotational dredging regime which leaves refuge sections to encourage revegetation and more generally, sympathetic maintenance practices.
- To maintain and increase existing populations of floating water plantain and re-introduce it to suitable historical locations.

13. Geology

The underlying geology of the area is mostly Triassic rocks formed between 195 to 225 million years ago. These rocks have been covered with a layer of clays, sands and gravels, deposited by the retreating glaciers of the late Pleistocene era (which ended approximately 12,000 years ago). It is these glacial sediments which have produced the characteristic landforms and features within the Meres and Mosses Natural Area.

The underlying rocks of the north Shropshire and Cheshire plain are almost entirely composed of red to brown sandstones, silts and muds. The sandstones were formed by dune systems from an earlier desert being eroded, transported and re-deposited by a major river system which originated in the south. In the warm, shallow waters of the time, silts and mudstones accumulated in a lagoon or gulf and evaporation of this shallow system, lead to the extensive salt deposits which can be found in the north. A rise in sea level during the

subsequent Jurassic era (135-195 million years ago) once more inundated this area, although evidence of this can only be found around Prees.

A number of igneous dykes cut through the Triassic rocks, which have also been affected by Tertiary mineralisation.

Whilst the scattered sandstone ridges are prominent in the flat plain and contrast is provided where rivers have cut down steeply into the glacial sediments, the greatest influence on today's landscape and habitats of the Meres and Mosses Natural Area was the retreat of the last ice sheet. The ice left behind unsorted deposits of sand, gravel and clay and larger boulders or erratics, which had been carried from as far as south west Scotland. A number of glacial landforms were also left behind including eskers, which mark the passage of water courses beneath the glacial ice and moraines marking the limit of glacial advance. Subsidence of the glacial sediments has occurred locally caused by the solution of the underlying salt deposits. The successive layers of peat have preserved pollen within them from the last 12,000 years which provides a record of the vegetational history of the area.

The present day complex geomorphology of the Rivers Dane, Dee, and Severn are also important to our understanding of modern fluvial processes.

As outliers from the South Shropshire Hills Natural Area, where they would be more typical, the three Precambrian outcrops around Shrewsbury, Haughmond Hill, Lyth Hill and Sharpstones Hill are extremely untypical hard rock features having their own characteristic flora.

13.1 Salt subsidence, glacial features and pollen stratigraphy

This group of geological resources includes a range of features formed during the glacial and postglacial period of the Natural Area's geological history.

Salt subsidence from the solution of underlying salt deposits, has resulted in the formation of Flashes, and is described in that section of the profile.

Glacial features of particular interest such as the apparent clustered distribution of mere and moss basins and the outstanding terminal glacial moraine north of Whitchurch are particularly important pieces of the pre-historic jigsaw.

A key feature of the Mosses is the preservation within the peat of pollen from plant species growing in and around the moss since the last glaciation. By taking cores of peat it is possible to 'read' the sites vegetational history in the layers of peat up to the present day. A number of human artefacts have been found including several dug-out canoes and items of jewellery in the peats around the meres indicating the value of such lakes to man through the ages.

Issues

- Mineral extraction will remove or have an impact on features of interest, eg the extensive winning of construction sand from the Delamere Forest so significantly modifying its undulating landscape.
- Peat extraction is destroying the historic pollen record.

- Lowering of water tables dries out the peat removing its preservative qualities.
- Infilling of subsidence flashes by natural siltation or use as landfill sites.
- Ploughing and levelling for agricultural improvement, removes the detail of landforms created during land subsidence.
- Incomplete knowledge of the palaeoecological resource.

Objectives

Key Objectives

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To have all sites identified, comprehensively surveyed, described and assessed.*
- *To have in place practicable monitoring programmes to gauge any further degradation or improvement of natural features.*
- *To involve owners and occupiers in the management of sites as part of their wider surroundings, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

Additional Habitat-specific objectives

- To encourage the search for and subsequent preservation of certain peatlands specifically for their irreplaceable palaeoecological record, to permit their continued study to elucidate the Natural Area's post-glacial vegetation history.

13.2 Triassic sandstone exposures

The exposures of sandstone within the Natural Area are important as they show a variety of features which were formed millions of years ago and which give clues to the state of the environment in that geological time. Exposures may be in the form of natural outcrops, cut rock faces along transport infrastructure routes, in quarries above ground or in mines underground

Large-scale cross bedding within sandstone is thought to have been caused as large dome shaped sand dunes developed. These features can be seen at Frodsham Railway and Road Cuttings SSSI, where it is also possible to tell from which direction the wind was blowing at that time. Alderley Edge SSSI is the only site in Britain in which non ferrous ore deposits of copper can be seen in the Triassic sedimentary host rock.

Raw Head and Dee Cliffs SSSIs reveal deposits which were more likely to have been left as sediments by a wide braided river system.

At Grinshill Quarries SSSI, excellent fossils of Rhynchosaurus, a genus of Triassic reptile known only to Britain have been found, along with footprints likely to have been made by the same animal.

Along the Bollin Valley, river eroded cliffs include areas of collapse breccia signalling the solution of the underlying salt beds which are up to 4m thick at this point.

Issues

- Fossil collecting will remove evidence of the species found at that time and destroy potentially important evidence through poor recording.
- Roads and other major development may cut through exposing or obscuring these features, or require them to be quarried for construction materials.
- Obscuration of exposures through natural processes of erosion and plant colonisation or tree planting.
- Lack of appreciation of the importance of geological features.

Objectives

Key Objectives

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To have all sites identified, comprehensively surveyed, described and assessed.*
- *To have in place practicable monitoring programmes to gauge any further degradation or improvement of natural features.*
- *To involve owners and occupiers in the management of sites as part of their wider surroundings, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

Additional Habitat-specific objectives

- To maintain recognised exposures free of vegetation to enable proper study.
- To improve/provide on site interpretive boards to ensure interest and understanding of local geology and its effect on local ecology.
- To ensure that when temporary exposures are revealed in the course of mineral working or development, provision is made for their geological survey and recording.

13.3 Fluvial geomorphology

There are a number of SSSI sites within the Natural Area which provide excellent examples of the processes and features formed by the movement of water along natural water courses.

The river sections which have been designated, demonstrate the evolution history of today's rivers in their terraces, river cliffs and cut off meanders. The River Dane is virtually unregulated and shortly after storms on the moorland above Macclesfield, a 'tidal wave' of flood water races down the Dane Valley, maintaining extremely active meander development. The River Dee SSSI, which has some of the most spectacular and intricately developed river meanders in Britain, is valuable in demonstrating the changes in river development and sediment transport under an increasingly regulated regime. The notified section lies much further downstream than that on the River Dane and includes a section in which river flows are affected by tidal levels in the estuary.

Issues

- River engineering destroys existing features and prevents study of the natural processes involved.
- Grazing of river banks reduces their stability and accelerates erosion at times of flood.
- Regulation of flow using storage reservoirs or any abstraction or discharge upstream of selected sites adversely affects natural river processes.

Objectives

Key Objectives

- *To maintain the existing resource and ensure its protection against development, exploitation and degradation.*
- *To have all sites identified, comprehensively surveyed, described and assessed.*
- *To have in place practicable monitoring programmes to gauge any further degradation or improvement of natural features.*
- *To involve owners and occupiers in the management of sites within their wider surroundings, harnessing their enthusiasm and sharing experience, to assist their understanding of the subtleties of 'ideal' conservation objectives.*

14. Glossary

Agri-environment Schemes

A series of government funded incentives to enable farmers to pursue more conservation orientated land manage.

Ancient woodland

Woodland which has had a continuous tree cover since at least 1600 AD. Their original area may have been reduced by clearance or have been adversely affected by replanting using non native hardwoods or conifers.

Assemblage

A group of species characteristically found in the same location due to the similarity of their habitat requirements.

Biodiversity

Describes the ‘variety of life’ including diversity between and within habitats and ecosystems, of species and at a genetic level within individual species.

British Red Data Book

A number of publications which describe species considered to be rare, or at critical population levels in Britain.

Carr

Woodland, usually with alder and willow which develops on wet, often peaty soils.

EC ‘Habitats’ Directive

Habitats and Species of international importance listed by the European Community Directive 92/43/EEC, which member states have a duty to protect and which has been ratified by British legislation. Selected Special Areas of Conservation in the UK have been submitted to the EC demonstrating the British Government’s commitment to safeguard these critical habitats and species.

Eutrophic

Rich in nutrients, usually referring to aquatic habitats.

Nationally rare

A species which has been recorded in 15 or less 10 km squares of the National Ordnance Survey grid.

Nationally scarce

A species which has been recorded in 16-100 10 km squares of the National Ordnance Survey grid.

Ramsar

Wetlands of International Importance, designated under a convention signed in Iran in 1971 by the British Government. EN presents the qualifying sites to the Department of the Environment for consideration.

Semi-natural vegetation

An area of land which has had its original, primeval vegetation removed, but which has been recolonised by native species through a process of succession. Almost all apparently natural vegetation in Britain should more actually be described as semi-natural; although within this Natural Area, some of the meres, mosses and inaccessible areas of clough woodland will have changed little over thousands of years and almost warrant the term ‘natural’.

Site of Special Scientific Interest (SSSI)

Areas of land identified in accordance with published guidelines, notified by EN as being of national importance for their fauna, flora, geological or physiographic features.

Special Area for Conservation (SAC)

Created under the EC 'Habitats' Directive to provide protection for key habitat types and species.

Succession

The process by which a series of plants colonise a substrate over time, such as a change from open water, through swamp and scrub to woodland.

Water Level Management Plan

A study and strategy to maintain appropriate watertables in wetland sites to be prepared by the 'Operating Authority' usually the Environment Agency or a Local Authority. Such plans are required by MAFF in their 1994 Guidance Note on Land Drainage and Flood Defence.

Wildlife and Countryside Act 1981 (amended 1985)

The main nature conservation legislation in Britain, which amongst other things, identifies species with varying degrees of protection and details SSSI procedures.

15. References

- ARNOLD, H.R. 1993. *Atlas of Mammals in Britain*. HMSO.
- Biodiversity: The UK Steering Group Report. Volume 2: Action Plans*. 1995. London: HMSO.
- CHESHIRE COUNTY COUNCIL. 1991. *A Nature Conservation Strategy for Cheshire*. Document No.441. Cheshire County Council.
- CHESHIRE COUNTY COUNCIL. 1992. *Countryside and Wildlife issues, Summary Report*. 1992. Document No. 429. Cheshire County Council.
- CHESHIRE COUNTY COUNCIL. 1992. *Technical Report Habitats and Wildlife*. 3. 1992. Document No. 458. Cheshire County Council.
- Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. 1992. HMSO.
- DEANS, P., and others. 1992. *An Atlas of the Breeding Birds of Shropshire*. Shropshire Ornithological Society
- EDEES, E.S. 1972. *Flora of Staffordshire*. Compton Press Ltd.
- ENGLISH NATURE. 1993. *Facts about amphibians*, leaflet.
- ENGLISH NATURE. 1993. *Inventory of Ancient Woodland*.
- ENGLISH NATURE. 1996. *The Lowland Heathland Inventory*. English Nature. RSPB.
- ENGLISH NATURE. 1996. *The Grassland Inventory*.
- LANGTON, T. 1989. *Snakes & Lizards*. Whittet Books.
- LOCKTON, A., WHILD, S., TRUEMAN, I., & PARKER, P. 1995. *Rare plants of Shropshire*. Shrewsbury Museums Service.
- NATURE CONSERVANCY COUNCIL. 1990. *Handbook for Phase 1 habitat survey*. NCC.
- NEWTON, A. 1971. *Flora of Cheshire*. Cheshire Community Council, Publications Trust Ltd.
- RACKHAM, O. 1986. *The History of the Countryside*. J M Dent & Sons Ltd.
- RODWELL, J.S. 1991. *Woodland and Scrub*. British Plant Communities Volume 1. Cambridge: Cambridge University Press.

RODWELL, J.S. 1991. *Mires and Heaths*. British Plant Communities Volume 2. Cambridge: Cambridge University Press.

RODWELL, J.S. 1992. *Grasslands and Montane communities*. British Plant Communities Volume 3. Cambridge: Cambridge University Press.

RODWELL, J.S. 1995. *Aquatic communities, swamps and tall-herb fens*. British Plant Communities Volume 4. Cambridge: Cambridge University Press.

SINKER, and others. 1985. *Ecological Flora of the Shropshire region*. Shropshire Trust for Nature Conservation.

STACE, C. 1991. *New Flora of the British Isles*. Cambridge.

WILDLIFE AND COUNTRYSIDE ACT. 1981. (as amended). HMSO

16. Habitat summaries

The following provides a summary of information for each of the Key Nature Conservation habitats within the Natural Area.

The Information is organised under the following headings:

Significant habitats - this is a listing of the major vegetation communities which make up the feature, classified in terms of the National Vegetation Classification (NVC) codes.

Significant species groups - a species group is significant if an assemblage of these species is an important feature of the habitat.

Characteristic species - those which are typically, frequently or dominantly found in their respective habitats.

Significant species - a species can be regarded as significant if it is listed on the Wildlife and Countryside Act 1981, the EC Habitats and Species Directive, or in the 1995 Biodiversity Steering Group Report. A species may also be significant if it has a limited distribution within the Natural Area.

Extinct/declining species - are species which might be considered for a species recovery or reintroduction programme.

Note: Although species have been simplistically allocated to only one category (characteristic, significant, extinct/declining), in reality they may fall into two or occasionally into all three.

Name of Natural Area: Meres and Mosses

Counties in Natural Area:

Cheshire
Staffordshire
Shropshire
Greater Manchester

LPAs in Natural Area:

Vale Royal
Macclesfield
Congleton
Crewe and Nantwich
Chester
Newcastle-under-Lyme
Stafford
South Staffordshire
North Shropshire
Wrekin
Shrewsbury and Atcham
South Shropshire
Oswestry
Stockport

English Nature Lead Team: West Midlands. Attingham Park, Shrewsbury, SY4 4TW.
Tel: 01743 709611

English Nature Contact Officer: Colin Hayes

Size of Natural Area:

Key Nature Conservation Habitats and Geological Features:

Meres and their fringes
Mosses and associated habitats
Swamp
Fen and fen grassland
Ancient woodland
Heathland
Unimproved Grassland
Floodplains
Ponds
Flashes
Canals

Salt subsidence, glacial features and pollen stratigraphy
Triassic sandstone exposures
Fluvial geomorphology

Key Nature Conservation Feature: Meres and their margins

‘Phase 1’ habitat classification

G1.2/3/4 Open water: standing, oligotrophic/ mesotrophic/eutrophic

Significance

International (wetland)
Local (birds)

NVC communities represented

- A5b *Ceratophyllum demersum* community: Lemna minor subcommunity
- A7 *Nymphaea alba* community
- A8 *Nuphar lutea* community
- A8a *Nuphar lutea* community: Species-poor subcommunity
- A9 *Potamogeton natans* community
- A10 *Polygonum amphibium* community
- A11b *Potamogeton pectinatus-Myriophyllum spicatum* community: *Elodea canadensis* subcommunity
- A15 *Elodea canadensis* community
- A22a *Littorella uniflora-Lobelia dortmanna* community: *Littorella uniflora* subcommunity

Significant Species Groups

Algae
Aquatic invertebrates
Aquatic macrophytes
Molluscs
Breeding wildfowl
Wintering wildfowl

Significant Species

<i>Elatine hexandra</i>	six-stamened waterwort
<i>Eleocharis acicularis</i>	slender spike-rush
<i>Nuphar pumila</i>	least water-lily
<i>Fontinalis antipyretica</i>	moss
<i>Noterus crassicornis</i>)
<i>Ilybius fenestatus</i>)
<i>Gyrinus paykulli</i>)
<i>Ilybius guttiger</i>)
<i>Helochares lividus</i>)
<i>Hydroporus neglectus</i>)
<i>Synanthedon formicaeformis</i>) invertebrates

Phalacrocer a replicata)
Anasimyia lunulata)
Tetragnatha striata)
Entelecara omissa)
Hypomma fulvum)
Potomophylax rotundipennix)
Hydatophylax infumatus)

Anas strepera gadwall
Anser anser grey lag goose
Alcedo atthis kingfisher
Aythya ferina pochard
Anas clypeata shoveler
Anas penelope wigeon

Characteristic Species

Littorella uniflora shoreweed
Callitriche hermaphroditica autumnal water-starwort
Potamogeton berchtoldii small pondweed
Ranunculus circinatus fan-leaved water-crowfoot

Anabaena flos-aquae blue-green algae
Eudorina elegans green algae
Microcystis aeruginosa blue-green algae

Aeshna juncea common hawker dragonfly
Aeshna grandis brown hawker dragonfly
Anax imperator emperor dragonfly
Caenis robusta may fly
Erythromma najas red-eyed damselfly

Ardea cinerea heron
Aythya fuligula tufted duck
Fulica atra coot
Podiceps cristatus great crested grebe
Anas platyrhynchos mallard

Extinct/declining species

Baldellia ranunculoides lesser water-plantain
Luronium natans floating water-plantain
Sparganium natans floating bur-reed

Podiceps nigricollis black-necked grebe

Osmerus eperlanus 'Rostherne' smelt

Designations

SSSI

Ramsar
SAC
NNR

Significant SSSIs

Abbots Moss (pools)	Ches
Aqualate Mere	Staffs
Bar Mere	Ches
Berrington Pool	Shrops
Betley Mere	Staffs
Bomere, Shomere And Betton Pools	Shrops
Brown Moss (pools)	Shrops
Chapel Mere	Ches
Cole Mere	Shrops
Comber Mere	Ches
Cop Mere	Staffs
Fenemere	Shrops
Hatch Mere	Ches
Hencott Pool	Shrops
Maer Pool	Staffs
Marion Pool, Chirbury	Shrops
Morton Pool And Pasture	Shrops
Norbury Meres	Ches
Oak Mere	Ches
Oss Mere	Shrops
Pettypool Brook Valley	Ches
Quoisley Meres	Ches
Rostherne Mere	Ches
Shrawardine Pool	Shrops
Sweat Mere And Crose Mere	Shrops
Tabley Mere	Ches
Tatton Meres	Ches
The Mere, Mere	Ches
White Mere	Shrops

Key Nature Conservation Feature: Mosses and associated habitats

'Phase 1' habitat classification

- E1.3 Mire: lowland raised bog
- E1.5 Mire: basin mire
- G1.1 Standing water: dystrophic (bog pools)

Significance

- International (wetland)
- Local (birds)

NVC communities represented

- A24a *Juncus bulbosus* community: *Utricularia vulgaris* agg. subcommunity
- A24b *Juncus bulbosus* community: *Sphagnum auriculatum* subcommunity
- M2 *Sphagnum cuspidatum/recurvum* bog pool community
- M2b *Sphagnum cuspidatum/recurvum* bog pool community: *Sphagnum recurvum* subcommunity
- M5 *Carex rostrata-Sphagnum squarrosum* mire
- M16 *Erica tetralix-Sphagnum compactum* wet heath
- M16a *Erica tetralix-Sphagnum compactum* wet heath: Typical subcommunity
- M18a *Erica tetralix-Sphagnum papillosum* raised & blanket mire: *Sphagnum magellanicum-Andromeda polyfolia* subcommunity
- M21 *Narthecium ossifragum-Sphagnum papillosum* valley mire
- M25 *Molinia caerulea-Potentilla erecta* mire
- S3 *Carex paniculata* swamp
- S7 *Carex acutiformis* swamp
- S27 *Carex rostrata-Potentilla palustris* tall-herb fen
- W4 *Betula pubescens-Molinia caerulea* woodland
- W4c *Betula pubescens-Molinia caerulea* woodland: *Sphagnum* spp. subcommunity
- W5 *Alnus glutinosa-Carex paniculata* woodland
- W5c *Alnus glutinosa-Carex paniculata* woodland: *Chrysosplenium oppositifolium* subcommunity
- W6 *Alnus glutinosa-Urtica dioica* woodland

Significant Species Groups

- Non-vascular plants-esp. Sphagnales
- Vascular plants
- Invertebrate assemblage

Significant Species

- | | |
|-------------------------------|-------------------------|
| <i>Andromeda polifolia</i> | bog-rosemary |
| <i>Carex elongata</i> | elongated sedge |
| <i>Eleocharis multicaulis</i> | many-stalked spike-rush |
| <i>Empetrum nigrum</i> | crowberry |
| <i>Myrica gale</i> | bog-myrtle |

<i>Osmunda regalis</i>	royal fern
<i>Utricularia vulgaris</i> agg.	greater bladderwort
<i>Riccia canaliculata</i>	liverwort
<i>Dicranum undulatum</i>	moss
<i>Dicranum affine</i>	moss
<i>Dolomedes fimbriatus</i>	raft spider
<i>Metriopectera brachyptera</i>	bog bush cricket
<i>Coenonympha tullia</i>	large heath butterfly
<i>Cordulia aenea</i>	downy emerald dragonfly
<i>Leucorrhinia dubia</i>	white-faced darter dragonfly
<i>Micracanthia marginalis</i>)
<i>Agonum ericeti</i>)
<i>Phacopteryx brevipennis</i>)
<i>Idea murivcata</i>)
<i>Rheumaptera hastata</i>) invertebrates
<i>Carsia sororiata</i>)
<i>Atolmis rubricollis</i>)
<i>Xylota florum</i>)
<i>Vipera berus</i>	adder
<i>Numenius arquata</i>	curlew

Characteristic Species

<i>Aulacomnium palustre</i>	
<i>Sphagnum cuspidatum</i>	bog moss
<i>Sphagnum fimbriatum</i>	bog moss
<i>Sphagnum palustre</i>	bog moss
<i>Sphagnum recurvum</i>	bog moss
<i>Sphagnum squarrosum</i>	bog moss
<i>Carex curta</i>	white sedge
<i>Drosera rotundifolia</i>	round-leaved sundew
<i>Dryopteris carthusiana</i>	narrow buckler fern
<i>Erica tetralix</i>	cross-leaved heath
<i>Eriophorum angustifolium</i>	common cottongrass
<i>Frangula alnus</i>	alder buckthorn
<i>Molinia caerulea</i>	purple moor-grass
<i>Vaccinium oxycoccus</i>	cranberry
<i>Gonepteryx rhamni</i>	brimstone
<i>Boloria selene</i>	small pearl-bordered fritillary
<i>Aeshna juncea</i>	common hawker
<i>Sympetrum danae</i>	black darter dragonfly
<i>Gallinago gallinago</i>	snipe
<i>Asio flammeus</i>	short-eared owl

Asio otus long-eared owl

Extinct/declining species

<i>Sphagnum balticum</i>	bog moss
<i>Sphagnum capillifolium</i>	bog moss
<i>Sphagnum compactum</i>	bog moss
<i>Sphagnum contortum</i>	bog moss
<i>Sphagnum magellanicum</i>	bog moss
<i>Sphagnum pulchrum</i>	bog moss
<i>Sphagnum riparium</i>	bog moss
<i>Sphagnum tenellum</i>	bog moss
<i>Carex limosa</i>	bog-sedge
<i>Carex lasiocarpa</i>	slender sedge
<i>Drosera longifolia</i>	great sundew
<i>Drosera intermedia</i>	oblong-leaved sundew
<i>Dryopteris cristatus</i>	crested buckler-fern
<i>Narthecium ossifragum</i>	bog asphodel
<i>Rhynchospora alba</i>	white beak-sedge
<i>Schoenus nigricans</i>	black bog-rush
<i>Scheuchzeria palustris</i>	Rannoch-rush
<i>Eilema sericea</i>)
<i>Cryptocephalus decemmaculatus</i>)
<i>Lathrobium rufipenne</i>)
<i>Hagenella clathrata</i>)
<i>Buckleria paludum</i>) invertebrates
<i>Parhelophilis consimilis</i>)
<i>Sitticus floricola</i>)
<i>Carorita limnaea</i>)
<i>Cyclophora pendularia</i>)
<i>Falco subbuteo</i>	hobby
<i>Caprimulgus europaeus</i>	nightjar

Designations

SSSI
Ramsar
SAC
NNR

Significant SSSIs

Abbots Moss	Ches
Black Firs & Cranberry Bog	Staffs
Black Lake/Delamere	Ches
Brookhouse Moss	Ches
Brown Moss	Shrops
Brownheath Moss	Shrops

Clarepool Moss	Shrops
Danes Moss	Ches
Doley Common	Staffs
Fenn's, Whixall, Bettisfield, Wem & Cadney Mosses	Shrops
Flaxmere Moss	Ches
Gleads Moss	Ches
Hatch Mere	Ches
Lin Can Moss	Shrops
Linmer Moss	Ches
Little Budworth Common	Ches
Loynton Moss	Staffs
Oak Mere	Ches
Oakhanger Moss	Ches
Wybunbury Moss	Ches

Key Nature Conservation Feature: Swamp

'Phase 1' habitat classification

F1.1 Swamp: single sp. dominant swamp

Significance

International

NVC communities represented

- S1 *Carex elata* swamp (rare)
- S2 *Cladium mariscus* sedge-swamp (rare)
- S3 *Carex paniculata* swamp
- S4a *Phragmites australis* swamp and reedbeds: *Phragmites australis* subcommunity
- S4b *Phragmites australis* swamp and reedbeds: *Galium palustre* subcommunity
- S5 *Glyceria maxima* swamp
- S6 *Carex riparia* swamp (rare)
- S7 *Carex acutiformis* swamp
- S8 *Scirpus lacustris* swamp
- S9 *Carex rostrata* swamp
- S10 *Equisetum fluviatile* swamp
- S11 *Carex vesicaria* swamp (rare)
- S12 *Typha latifolia* swamp
- S13 *Typha angustifolia* swamp
- S14 *Sparganium erectum* swamp
- S15 *Acorus calamus* swamp (rare)
- S20 *Scirpus lacustris tabernaemontani* swamp
- W1 *Salix cinerea-Galium palustre* woodland
- W2a *Salix cinerea-Betula pubescens-Phragmites australis* woodland: *Alnus-Filipendula* subc.
- W2b *Salix cinerea-Betula pubescens-Phragmites australis* woodland: *Sphagnum* subcommunity.

Significant Species Groups

Coleoptera
Odonata
Breeding birds
Wintering wildfowl
Bats

Significant Species

<i>Carex elata</i>	tufted-sedge
<i>Cladium mariscus</i>	great fen-sedge
<i>Cordulia aenea</i>	downy emerald dragonfly

<i>Coenagrion pulchellum</i>	variable damselfly
<i>Brachytron pratense</i>	hairy dragonfly
<i>Cercyon convexiusculus</i>	'water' beetle
<i>Cercyon sternalis</i>	'water' beetle
<i>Dixella filicornis</i>	fly

Characteristic Species

<i>Alnus glutinosa</i>	alder
<i>Carex acutiformis</i>	lesser pond-sedge
<i>Carex paniculata</i>	greater tussock sedge
<i>Carex rostrata</i>	bottle sedge
<i>Equisetum fluviatile</i>	water horsetail
<i>Galium palustre</i>	common marsh-bedstraw
<i>Glyceria maxima</i>	reed sweet-grass
<i>Phalaris arundinacea</i>	reed canary-grass
<i>Phragmites australis</i>	common reed
<i>Salix cinerea</i>	sallow
<i>Sparganium erectum</i>	branched bur-reed
<i>Typha angustifolia</i>	lesser bulrush
<i>Typha latifolia</i>	bulrush
<i>Acrocephalus scirpaceus</i>	reed warbler
<i>Pipistrellus pipistrellus</i>	pipistrelle bat

Extinct/declining species

<i>Gallinago gallinago</i>	snipe
<i>Hirundo rustica</i>	swallow
<i>Riparia riparia</i>	sand martin
<i>Acrocephalus schoenobaenus</i>	sedge warbler
<i>Motacilla flava</i>	yellow wagtail
<i>Botaurus stellaris</i>	bittern
<i>Circus aeruginosus</i>	marsh harrier
<i>Parus montanus</i>	willow tit
<i>Tetanocera freyi</i>	fly
<i>Coenagrion pulchellum</i>	variable damselfly
<i>Brachytron pratense</i>	hairy dragonfly

Designations

SSSI
NNR
Ramsar
SAC

Significant SSSIs

Aqualate Mere	Staffs
Bagmere	Ches
Baswich Meadows	Staffs
Betley Mere	Staffs
Brown Moss	Shrops
Chapel Mere	Ches
Cop Mere	Staffs
Doxey And Tillington Marshes	Staffs
Fenemere	Shrops
Marion Pool, Chirbury	Shrops
Morton Pool And Pasture	Shrops
Quoisley Meres	Ches
Rostherne Mere	Ches
Sandbach Flashes	Ches
Sweat Mere And Crose Mere	Shrops
Tatton Meres	Ches
The Mere, Mere	Ches

Key Nature Conservation Feature: Fen and fen grassland

'Phase 1' habitat classification

- F1.2 Tall Fen vegetation
- B5 Grassland: marsh/marshy grassland

Significance

- National (grassland)
- National (wetland)
- Local (birds)

NVC communities represented

- S25 *Phragmites australis-Eupatorium cannabinum* tall-herb fen
- S26 *Phragmites australis-Urtica dioica* fen
- S28 *Phalaris arundinacea* tall-herb fen
- M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow: *Briza media-Trifolium* spp. subcommunity
- M23 *Juncus effusus/acutiflorus-Galium palustre* rush-pasture
- M23a *Juncus effusus/acutiflorus-Galium palustre* rush-pasture: *Juncus acutiflorus* subcommunity
- M23b *Juncus effusus/acutiflorus-Galium palustre* rush-pasture: *Juncus effusus* subcommunity
- M24 *Molinia caerulea-Cirsium dissectum* fen-meadow
- M25 *Molinia caerulea-Potentilla erecta* mire
- M27 *Filipendula ulmaria-Angelica sylvestris* mire
- M29 *Hypericum elodes-Potamogeton polygonifolius* soakway
- MG4 *Alopecurus pratensis-Sanguisorba officianalis* grassland
- MG5 *Cynosurus cristatus-Centaurea nigra* grassland
- MG8 *Cynosurus cristatus-Caltha palustris* grassland
- MG9 *Holcus lanatus-Deschampsia cespitosa* grassland
- MG10 *Holcus lanatus-Juncus effusus* rush-pasture
- W1 *Salix cinerea-Galium palustre* woodland
- W2a *Salix cinerea-Betula pubescens-Phragmites australis* woodland: *Alnus-Filipendula* subc.
- W2a *Salix cinerea-Betula pubescens-Phragmites australis* woodland: Sphagnum subcmnty.

Significant Species Groups

- Coleoptera
- Breeding waders

Significant Species

- | | |
|--------------------------------|-------------------|
| <i>Calamagrostis canescens</i> | purple small-reed |
| <i>Carex disticha</i> | brown sedge |
| <i>Carex elongata</i> | elongated sedge |

<i>Carex lasiocarpa</i>	slender sedge
<i>Cicuta virosa</i>	cowbane
<i>Cirsium dissectum</i>	meadow thistle
<i>Cladium mariscus</i>	great fen-sedge
<i>Dactylorhiza incarnata</i>	early marsh-orchid
<i>Dactylorhiza maculata</i> <i>ssp. ericetorum</i>	heath spotted-orchid
<i>Dactylorhiza praetermissa</i>	southern marsh-orchid
<i>Dactylorhiza purpurella</i>	northern marsh-orchid
<i>Eleocharis uniglumis</i>	one-glumed spike-rush
<i>Fritillaria meleagris</i>	fritillary
<i>Juncus subnodulosus</i>	blunt-flowered rush
<i>Listera ovata</i>	common twayblade
<i>Myosoton aquaticum</i>	water chickweed
<i>Osmunda regalis</i>	royal fern
<i>Salix repens</i>	creeping willow
<i>Thelypteris palustris</i>	marsh fern
<i>Numenius arquata</i>	curlew

Characteristic Species

<i>Alisma plantago-aquatica</i>	water-plantain
<i>Anagallis tenella</i>	bog pimpernel
<i>Berula erecta</i>	lesser water-parsnip
<i>Caltha palustris</i>	marsh-marigold
<i>Carex acutiformis</i>	lesser pond-sedge
<i>Carex pallescens</i>	pale sedge
<i>Carex pseudocyperus</i>	cyperus sedge
<i>Carex rostrata</i>	bottle sedge
<i>Equisetum palustre</i>	marsh horsetail
<i>Galium palustre</i>	common marsh-bedstraw
<i>Geum rivale</i>	water avens
<i>Hydrocotyle vulgaris</i>	marsh pennywort
<i>Hypericum humifusum</i>	trailing St. John's-wort
<i>Juncus</i> spp.	rushes
<i>Iris pseudacorus</i>	yellow iris
<i>Lychnis flos-cuculi</i>	ragged-Robin
<i>Lycopus europaeus</i>	gypsywort
<i>Mentha aquatica</i>	water mint
<i>Menyanthes trifoliata</i>	bogbean
<i>Molinia caerulea</i>	purple moor-grass
<i>Oenanthe fistulosa</i>	tubular water-dropwort
<i>Phalaris arundinacea</i>	reed canary-grass
<i>Phragmites australis</i>	common reed
<i>Potentilla palustris</i>	marsh cinquefoil
<i>Rumex hydrolapathum</i>	water dock
<i>Sanguisorba officinalis</i>	great burnet
<i>Senecio aquaticus</i>	marsh ragwort
<i>Scutellaria galericulata</i>	skullcap

<i>Silaum silaus</i>	pepper-saxifrage
<i>Sparganium erectum</i>	branched bur-reed
<i>Triglochin palustris</i>	marsh arrowgrass
<i>Typha latifolia</i>	bulrush
<i>Valeriana dioica</i>	marsh valerian
<i>Viola palustris</i>	marsh violet
<i>Agriphilia selasella</i>	moth
<i>Boloria seleno</i>	small pearl-bordered fritillary
<i>Natrix natrix</i>	grass snake
<i>Ardea cinerea</i>	heron

Extinct/declining species

<i>Carex diandra</i>	lesser tussock-sedge
<i>Carex viridula</i> ssp <i>viridula</i>	yellow sedge
<i>Epipactis palustris</i>	marsh helleborine
<i>Gymnadenia conopsea</i>	fragrant orchid
<i>Parnassia palustris</i>	grass-of-Parnassus
<i>Serratula tinctoria</i>	saw-wort
<i>Thalictrum flavum</i>	common meadow-rue
<i>Gallinago gallinago</i>	snipe
<i>Tringa totanus</i>	lapwing
<i>Vanellus vanellus</i>	redshank
<i>Tito alba</i>	barn owl

Designations

SSSI
 NNR
 Ramsar
 SAC

Significant SSSIs

Aqualate Mere	Staffs
Bagmere	Ches
Baswich Meadows	Staffs
Betley Mere	Staffs
Doxey And Tillington Marshes	Staffs
Hatch Mere	Ches
Linmer Moss	Ches
Loynton Moss	Staffs
Morton Pool And Pasture	Shrops
Norbury Meres	Ches
Old River Bed, Shrewsbury	Shrops
Pettypool Brook Valley	Ches
Quoisley Meres	Ches

Shrawadine Pool Shrops
Tabley Mere Ches
Wybunbury Moss Ches

Key Nature Conservation Feature: Ancient Woodland (Clough)

‘Phase 1’ habitat classification

A1.1.1 Woodland: broadleaved, semi-natural

Significance

National (woodland)
Local (birds)

NVC communities represented

W6 *Alnus glutinosa-Urtica dioica* woodland
W6b *Alnus glutinosa-Urtica dioica* woodland: *Salix fragilis* subcommunity
W7 *Alnus glutinosa-Fraxinus excelsior-Lysimachia nemorum* woodland
W7a *Alnus glutinosa-Fraxinus excelsior-Lysimachia nemorum* woodland: *Urtica dioica* subcommunity
W8 *Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland
W8e *Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland: *Geranium robertianum* subcommunity
W10 *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland
W10a *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland: Typical subcommunity

Significant Species Groups

Invertebrates - Coleoptera
Mollusca

Significant Species

<i>Acer campestre</i>	field maple
<i>Campanula trachelium</i>	nettle-leaved bellflower
<i>Carex strigosa</i>	thin-spiked wood-sedge
<i>Euonymus europaeus</i>	spindle
<i>Hordelymus europaeus</i>	wood barley
<i>Luzula sylvatica</i>	great wood-rush
<i>Orchis mascula</i>	early purple orchid
<i>Polygonatum multiflorum</i>	Soloman's seal
<i>Polystichum aculeatum</i>	hard shield-fern
<i>Polystichum setiferum</i>	soft shield-fern
<i>Prunus padus</i>	bird-cherry
<i>Sorbus torminalis</i>	wild service-tree
<i>Stellaria nemorum</i>	wood stitchwort
<i>Tilia cordata</i>	small-leaved lime
<i>Vicia sylvatica</i>	wood vetch

<i>Pterostichus oblongopunctatus</i>)
<i>Megatoma undata</i>)
<i>Anitys rubens</i>)
<i>Cryptarcha strigata</i>)
<i>Rhizophagus nitidulus</i>) invertebrates
<i>Mycetophagus piceus</i>)
<i>Annomatus diecki</i>)
<i>Melandrya caraboides</i>)
<i>Dryocoetinus alni</i>)
<i>Sphindus dubius</i>)

Significant species of parkland trees

<i>Prionocyphon serricornis</i>)
<i>Agrilus laticornis</i>)
<i>Agrilus sinuatus</i>)
<i>Ctesias sera</i>)
<i>Dorcatoma flavicornis</i>)
<i>Anitys rubens</i>)
<i>Hylecoetus dermestoides</i>)
<i>Rhizophagus picipes</i>)
<i>Mycetophagus piceus</i>) invertebrates
<i>Cis festivus</i>)
<i>Prionychus ater</i>)
<i>Conopalpus testaceus</i>)
<i>Plegaderus dissectus</i>)
<i>Abraeus granulum</i>)
<i>Notolaemus unifasciatus</i>)

Characteristic Species

<i>Allium ursinum</i>	ramsons
<i>Alnus glutinosa</i>	alder
<i>Arum maculatum</i>	wood arum
<i>Betula pubescens</i>	downy birch
<i>Campanula latifolia</i>	giant bellflower
<i>Chrysosplenium oppositifolium</i>	opposite-leaved golden saxifrage
<i>Corylus avellana</i>	hazel
<i>Dryopteris dilatata</i>	broad buckler-fern
<i>Dryopteris felix-mas</i>	male fern
<i>Fraxinus excelsior</i>	ash
<i>Galium odoratum</i>	woodruff
<i>Geranium robertianum</i>	herb-Robert
<i>Hyacinthoides non-scriptus</i>	bluebell
<i>Lamiasium galeobdolon</i>	yellow archangel
<i>Melica uniflora</i>	wood melick
<i>Mercurialis perennis</i>	dog's mercury
<i>Milium effusum</i>	wood millet
<i>Oxalis acetosella</i>	wood-sorrel

<i>Phyllitis scolopendrium</i>	hart's tongue fern
<i>Prunus avium</i>	wild cherry
<i>Pteridium aquilinum</i>	bracken
<i>Quercus robur</i>	pedunculate oak
<i>Ranunculus auricomus</i>	goldilocks buttercup
<i>Rubus fruticosus</i>	bramble
<i>Urtica dioica</i>	nettle
<i>Parus palustris</i>	marsh tit

Extinct/declining species

<i>Gymnocarpium dryopteris</i>	oak fern
<i>Paris quadrifolia</i>	herb Paris
<i>Thelypteris phegopteris</i>	beech fern

Designations

SSSI

Significant SSSIs

Beechmill Wood And Pasture	Ches
Hatton's Hey Wood, Whittle's Corner and Bank Rough	Ches
Holly Banks	Ches
Madams Wood	Ches
Taylor's Rough and Wellmeadow Wood	Ches
Warburton's Wood and Well Wood	Ches
Well Rough and Long Plantation	Ches
Wettenhall and Darnhall Woods	Ches
Wimboldsley Wood	Ches

Other woodland:

Big Hyde Rough	Staffs
Burnt Wood	Staffs

Key Nature Conservation Feature: Ancient Woodland (Sandstone Ridge)

'Phase 1' habitat classification

A1.1.1 Woodland: broadleaved, semi-natural

Significance

National (woodland)

Local (birds)

NVC communities represented

W16 *Quercus spp.-Betula spp.-Deschampsia flexuosa* woodland

W16b *Quercus spp.-Betula spp.-Deschampsia flexuosa* woodland: *Vaccinium myrtillus- Dryopteris dilatata* subcommunity

Significant Species Groups

Invertebrates-esp Coleoptera

Significant Species

Melampyrum pratense common cow-wheat

Accipiter nisus sparrowhawk

Buteo buteo buzzard

Ficedula hypoleuca pied flycatcher

Corvus corax raven

Characteristic Species

Betula pubescens downy birch

Blechnum spicant hard fern

Deschampsia flexuosa wavy hair-grass

Dryopteris dilatata broad buckler-fern

Hyacinthoides non-scriptus bluebell

Ilex aquifolium holly

Pteridium aquilinum bracken

Quercus petraea sessile oak

Quercus robur pedunculate oak

Rubus fruticosus bramble

Sorbus aucuparia rowan

Vaccinium myrtillus bilberry

Phoenicurus phoenicurus redstart

Phylloscopus sibilatrix wood warbler

Extinct/declining species

Designations

SSSI

Significant SSSIs

Dunsdale Hollow	Ches
King's And Hargreaves Woods	Staffs
Peckforton Woods	Ches

Key Nature Conservation Feature: Heathland

'Phase 1' habitat classification

- D1.1 Heathland: dry dwarf shrub heath, acid
- D2.2 Heathland: wet dwarf shrub heath, lowland

Significance

National

NVC communities represented

- H8a *Calluna vulgaris-Ulex gallii* heath: Species-poor subcommunity
- H9a *Calluna vulgaris-Deschampsia flexuosa* heath: *Hypnum cupressiforme* subcommunity
- H12 *Calluna vulgaris-Vaccinium myrtillus* heath
- M16a *Erica tetralix-Sphagnum compactum* wet heath: Typical subcommunity

Significant Species Groups

Invertebrate assemblage

Significant Species

<i>Leucobryum glaucum</i>	moss
<i>Aira praecox</i>	early hair-grass
<i>Drosera rotundifolia</i>	round-leaved sundew
<i>Ornithopus perpusillus</i>	bird's-foot
<i>Scleranthus annuus</i>	knawel
<i>Trifolium striatum</i>	soft trefoil
<i>Aphrodes trifasciatus</i>)
<i>Plebejus argus</i>)
<i>Metrioptera brachyptera</i>) invertebrates
<i>Crambus pratella</i>)
<i>Percornia strigillaria</i>)
<i>Ceutorhynchus atomus</i>)
<i>Hypena crassalis</i>	beautiful snout moth
<i>Furcula bicuspis</i>	alder kitten moth
<i>Holocentropus stagnalis</i>	caddis fly
<i>Sitticus floricola</i>	jumping spider

Characteristic Species

<i>Sphagnum auriculatum</i>	bog moss
<i>Sphagnum compactum</i>	bog moss
<i>Sphagnum fimbriatum</i>	bog moss
<i>Sphagnum palustre</i>	bog moss

<i>Betula pubescens</i>	downy birch
<i>Calluna vulgaris</i>	heather
<i>Cytisus scoparius</i>	broom
<i>Deschampsia flexuosa</i>	wavy hair-grass
<i>Erica cinerea</i>	bell heather
<i>Erica tetralix</i>	cross-leaved heath
<i>Molinia caerulea</i>	purple moor-grass
<i>Nardus stricta</i>	mat-grass
<i>Ulex europaeus</i>	gorse
<i>Ulex gallii</i>	western gorse
<i>Vaccinium myrtillus</i>	bilberry
<i>Cordulia aenea</i>	downy emerald dragonfly
<i>Sympetrum striolatum</i>	common darter
<i>Perconia strigillaria</i>	grass wave moth
<i>Callophrys rubi</i>	green hairstreak butterfly
<i>Cincindela campestris</i>	green tiger beetle
<i>Natrix natrix</i>	grass snake
<i>Lacerta vivipara</i>	common lizard

Extinct/declining species

<i>Filago vulgaris</i>	common cudweed
<i>Filago minima</i>	small cudweed
<i>Genista anglica</i>	petty whin
<i>Hypericum humifusum</i>	trailing St. John's-wort
<i>Hypericum elodes</i>	marsh St. John's-wort
<i>Hypochoeris glabra</i>	smooth cat's-ear
<i>Lycopodiella inundata</i>	marsh clubmoss
<i>Mentha pulegium</i>	pennyroyal
<i>Moenchia erecta</i>	upright chickweed
<i>Narthecium ossifragum</i>	bog asphodel
<i>Osmunda regalis</i>	royal fern
<i>Pilularia globulifera</i>	pillwort
<i>Radiola linoides</i>	allseed
<i>Trichophorum caespitosum</i>	deer grass
<i>Metriopectera brachyptera</i>	bog bush cricket
<i>Plebejus argus</i>	silver-studded blue butterfly
<i>Sympetrum danae</i>	black darter dragonfly
<i>Coenonympha tullia</i>	large heath butterfly
<i>Caprimulgus europaeus</i>	nightjar
<i>Anthus trivialis</i>	tree pipit

Designations

SSSI

Significant SSSIs

Bickerton Hill	Ches
Hodnet Heath	Shrops
Lindow Common	Ches
Little Budworth Common	Ches
Prees Heath	Shrops
Sound Heath	Ches

Key Nature Conservation Feature: Unimproved Grassland

'Phase 1' habitat classification

- B2.1.1 Grassland: acidic, unimproved
- B2.1.3 Grassland: acidic, marshy
- B2.2 Grassland: neutral, unimproved
- E2.2 Flush: basic

Significance

National

NVC communities represented

- MG4 *Alopecurus pratensis*-*Sanguisorba officinalis* grassland
- MG5a *Cynosurus cristatus*-*Centaurea nigra* grassland: *Lathyrus pratensis* subcommunity
- MG5b *Cynosurus cristatus*-*Centaurea nigra* grassland: typical subcommunity
- MG5c *Cynosurus cristatus*-*Centaurea nigra* grassland: *Danthonia decumbens* subcommunity
- MG8 *Cynosurus cristatus*-*Caltha palustris* grassland
- MG9 *Holcus lanatus*-*Deschampsia cespitosa* grassland
- MG10 *Holcus lanatus*-*Juncus effusus* rush-pasture
- MG13 *Agrostis stolonifera*-*Alopecurus geniculatus* grassland
- M22 *Juncus subnodulosus*-*Cirsium palustre* fen-meadow
- M23 *Juncus effusus/acutiflorus*-*Galium palustre* rush-pasture

Significant Species Groups

Vascular plants

Significant Species

- | | |
|------------------------------|-------------------|
| <i>Carex echinata</i> | star sedge |
| <i>Epipactis palustris</i> | marsh helleborine |
| <i>Pedicularis palustris</i> | marsh lousewort |

Characteristic Species

- | | |
|-----------------------------|-----------------------|
| <i>Agrostis stolonifera</i> | creeping bent |
| <i>Ajuga reptans</i> | bugle |
| <i>Alopecurus pratensis</i> | meadow foxtail |
| <i>Briza media</i> | quaking-grass |
| <i>Cardamine pratensis</i> | cuckooflower |
| <i>Carex caryophylla</i> | spring sedge |
| <i>Carex flacca</i> | glaucous sedge |
| <i>Centaurea nigra</i> | common knapweed |
| <i>Cynosurus cristatus</i> | crested dog's-tail |
| <i>Dactylorhiza fuchsii</i> | common spotted-orchid |

<i>Deschampsia cespitosa</i>	tufted hair-grass
<i>Festuca pratensis</i>	meadow fescue
<i>Holcus lanatus</i>	Yorkshire fog
<i>Hypochaeris radicata</i>	cat's-ear
<i>Juncus conglomeratus</i>	compact rush
<i>Juncus effusus</i>	soft-rush
<i>Juncus inflexus</i>	hard rush
<i>Lathyrus pratensis</i>	meadow vetchling
<i>Leontodon autumnalis</i>	autumn hawkbit
<i>Leontodon hispidus</i>	rough hawkbit
<i>Leucanthemum vulgare</i>	ox-eye daisy
<i>Luzula campestris</i>	field wood-rush
<i>Ononis spinosa</i>	spiny restharrow
<i>Pedicularis sylvatica</i>	lousewort
<i>Pilosella officinarum</i>	mouse-ear-hawkweed
<i>Pimpinella major</i>	greater burnet-saxifrage
<i>Primula veris</i>	cowslip
<i>Pulicaria dysenterica</i>	common fleabane
<i>Rhinanthus minor</i>	yellow-rattle
<i>Sanguisorba officinalis</i>	great burnet
<i>Silaum silaus</i>	pepper-saxifrage
<i>Succisa pratensis</i>	devil's-bit scabious
<i>Motacilla flava</i>	yellow wagtail
<i>Miliaria calandra</i>	corn bunting

Extinct/declining species

<i>Ophioglossum vulgatum</i>	adder's-tongue
<i>Orchis morio</i>	green-winged orchid
<i>Platanthera clorantha</i>	greater butterfly-orchid
<i>Serratula tinctoria</i>	saw-wort
<i>Tyto alba</i>	barn owl
<i>Coturnix coturnix</i>	quail
<i>Miliaria calandra</i>	corn bunting

Designations

SSSI

Significant SSSIs

Allimore Green Common	Staffs
Crofts Mill Pasture	Shrops
Fernhill Pastures	Shrops
Hatherton Flush	Ches
Melverley Farm	Shrops
Mottey Meadows	Staffs
Ruewood Pastures	Shrops

parts of:

Beechmill Wood and Pasture	Ches
Madams Wood	Ches
Morton Pool And Pasture	Shrops
Warburton's Wood and Well Wood	Ches
Wettenhall and Darnhall Woods	Ches
Wimboldsley Wood	Ches

Key Nature Conservation Feature: Floodplains

'Phase 1' habitat classification

- A3 Scattered trees
- B2.2 Neutral grassland semi-improved
- F1.1 Single species dominant swamp
- F1.2 Tall fen vegetation
- F2.2 Inundation communities
- G1 Open water: standing
- G2 Open water: running

Significance National

Significant Species Groups

- Aquatic macrophytes
- Odonata
- Breeding and overwintering waterfowl and waders

Significant Species

<i>Populus nigra</i>	black poplar
<i>Gomphus vulgatissimus</i>	club-tailed dragonfly
<i>Isogenus nubecula</i>	stonefly
<i>Platynemis pennipes</i>)
<i>Bembidion litorale</i>)
<i>Trechus rubens</i>) invertebrates
<i>Plectrocnemia brevis</i>)
<i>Hydropsyche fulvipes</i>)
<i>Astacus pallipes</i>	cray fish
<i>Alcedo atthis</i>	kingfisher
<i>Anas acuta</i>	pintail
<i>Anas crecca</i>	teal
<i>Anas penelope</i>	wigeon
<i>Lutra lutra</i>	otter

Characteristic Species

<i>Hordeum sacelinum</i>	meadow barley
<i>Ranunculus fluitans</i>	long-leaved water-crowfoot
<i>Sanguisorba officianalis</i>	great burnet
<i>Calopteryx splendens</i>	banded demoiselle
<i>Ephemera danica</i>	anglers drake

Extinct/declining species

Thalitricum flavum common meadow rue

Anser albifrons white-fronted goose

Designations

SSSI

Significant SSSIs

Doxey and Tillington Marshes	Staffs
River Dane	Ches
River Dee	Ches
River Severn	Shrops

Other floodplains

River Bollin
R. Gowy
R. Meese
R. Penk
R. Perry
R. Roden
R. Sow
R. Strine
R. Tern
R. Weaver
Doley Brook
Lonco Brook
Meece Brook
Rea Brook

Key Nature Conservation Feature: Ponds

'Phase 1' habitat classification

- F1.1 Single species dominant swamp
- F1.2 Tall fen vegetation
- G1.3/4 Open water: standing, mesotrophic/eutrophic
- A1.1.1 Woodland, broadleaved, semi-natural (wet)

Significance

Local/National

NVC communities represented

- A2a *Lemna minor* community: species-poor subcommunity
- A2b *Lemna minor* community: *Lemna trisulca* subcommunity
- A2c *Lemna minor* community: *Riccia-Ricciocarpus* subcommunity (rare)
- A4 *Hydrocharis morsus-ranae-Stratiotes aloides* community (rare)
- A5 *Ceratophyllum demersum*
- A6 *Ceratophyllum submersum* (rare)
- A9a *Potamogeton natans*
- A9b *Potamogeton natans* community: *Elodea canadensis* subcommunity
- A10 *Polygonum amphibium*
- A15 *Elodea canadensis*
- A16a *Callitriche stagnalis* community: *Callitriche* spp. subcommunity
- A19 *Ranunculus aquatilis*
- A20 *Ranunculus peltatus* (rare)
- S1 *Carex elata* swamp (rare)
- S3 *Carex paniculata* swamp
- S4 *Phragmites australis* swamp and reedbeds
- S5 *Glyceria maxima* swamp
- S7 *Carex acutiformis* swamp
- S8 *Scirpus lacustris* swamp
- S10 *Equisetum fluviatile* swamp
- S11 *Carex vesicaria* swamp (rare)
- S12 *Typha latifolia* swamp
- S13 *Typha angustifolia* swamp
- S14 *Sparganium erectum* swamp
- S15 *Acorus calamus* swamp (rare)
- S19 *Eleocharis palustris*
- S21 *Scirpus maritimus* (rare)
- S22 *Glyceria fluitans* water margin vegetation
- S23 other water margin vegetation
- S27 *Carex rostrata-Potentilla palustris* (rare)
- S28 *Phalaris arundinacea*
- M23a *Juncus acutiflorus-Galium palustre* rush pasture
- MG10a *Holcus lanatus-Juncus acutiflorus* rush pasture
- MG10a *Holcus lanatus-Juncus effusus* rush pasture
- W1 *Salix cinerea-Galium palustre* woodland

- W2a *Salix cinerea-Betula pubescens-Phragmites australis* woodland: *Alnus-Filipendula* subc.
 W2a *Salix cinerea-Betula pubescens-Phragmites australis* woodland: *Sphagnum* subcmnty.

Significant Species Groups

Amphibians
 Odonata
 Wetland plants
 Water beetles
 Stoneworts

Significant Species

<i>Hottonia palustris</i>	water-violet
<i>Lemna gibba</i>	gibbous duckweed
<i>Spirodela polyrhiza</i>	great duckweed
<i>Dytiscus circumflexus</i>	diving beetle
<i>Enochrus isotae</i>	'water' beetle
<i>Triturus helveticus</i>	palmate newt

Characteristic Species

<i>Sphagnum squarrosum</i>	bog moss
<i>Alisma plantago-aquatica</i>	water-plantain
<i>Bidens cernua</i>	nodding bur-mari gold
<i>Berula erecta</i>	lesser water-parsnip
<i>Callitriche stagnalis</i>	common water-starwort
<i>Cardamine pratensis</i>	cuckooflower
<i>Carex pseudocyperus</i>	Cyperus sedge
<i>Eleocharis palustris</i>	common spike-rush
<i>Elodea canadensis</i>	Canadian waterweed
<i>Epilobium hirsutum</i>	great willowherb
<i>Equisetum fluviatile</i>	water horsetail
<i>Galium palustre</i>	common marsh-bedstraw
<i>Glyceria fluitans</i>	floating sweet-grass
<i>Hydrocotyle vulgaris</i>	marsh pennywort
<i>Juncus effusus</i>	soft-rush
<i>Juncus inflexus</i>	hard rush
<i>Lemna minor</i>	common duckweed
<i>Lemna trisulca</i>	ivy-leaved duckweed
<i>Lotus pedunculatus</i>	greater bird's-foot-trefoil
<i>Lythrum salicaria</i>	purple-loosestrife
<i>Menyanthes trifoliata</i>	bogbean
<i>Myosotis caespitosus</i>	water forget-me-not
<i>Oenanthe fistulosa</i>	tubular water-dropwort

<i>Potamogeton natans</i>	broad-leaved pondweed
<i>Potentilla palustris</i>	marsh cinquefoil
<i>Ranunculus sceleratus</i>	celery-leaved buttercup
<i>Solanum dulcamara</i>	bittersweet
<i>Sparganium erectum</i>	branched bur-reed
<i>Typha latifolia</i>	bulrush
<i>Libellula depressa</i>	broad-bodied chaser dragonfly
<i>Libellula quadrimaculata</i>	four-spotted chaser dragonfly
<i>Sympetrum striolatum</i>	common darter dragonfly

Extinct/declining species

<i>Ricciocarpus natans</i>	liverwort
<i>Carex diandra</i>	lesser tussock-sedge
<i>Ceratophyllum submersum</i>	spineless horn-wort
<i>Circuta virosa</i>	cowbane
<i>Hydrocharis morsus-ranae</i>	frogbit
<i>Bidens tripartita</i>	trifid bur-marigold
<i>Myriophyllum verticillatum</i>	whorled water-milfoil
<i>Agabus unguicularis</i>	'water' beetle
<i>Hydrochara caraboides</i>	lesser silver diving beetle
<i>Anisus leucostoma</i>	button ramshorn snail
<i>Aplexa hypnorum</i>	moss bladder snail
<i>Lymnaea glabra</i>	mud snail
<i>Planorbis planorbis</i>	ramshorn snail
<i>Brachytron pratense</i>	hairy dragonfly
<i>Coenagrion pulchellum</i>	variable damselfly
<i>Erythromma najas</i>	red-eyed damselfly
<i>Sympetrum sanguinum</i>	ruddy darter dragonfly
<i>Triturus cristatus</i>	great crested newt
<i>Arvicola amphibius</i>	water vole

Designations

SINC

Significant SSSIs

None

Key Nature Conservation Feature: Subsidence flashes and inland salt-marsh

‘Phase 1’ habitat classification

- G1.4 Open water: standing eutrophic
- G1.6 Open water: standing brackish
- H2.5 Inland salt marsh

Significance

National

NVC communities represented

- A11 Potamogeton pectinatus-Myriophyllum spicatum community
- SM12 Aster tripolium (rayed) on saltmarshes
- SM23 Spargularia marina-Puccinellia distans saltmarsh

Significant Species Groups

- Brackish water invertebrates
- Freshwater invertebrates
- Migrant waders

Significant Species

- | | |
|------------------------------|-----------------------|
| <i>Sigara stagnalis</i> | water boatman |
| <i>Gammarus duebeni</i> | shrimp |
| <i>Gammarus tigrinus</i> | shrimp |
| <i>Dytiscus circumflexus</i> | large water beetle |
|
 | |
| <i>Gyraulus laevis</i> | smooth ramshorn snail |

Characteristic Species

- | | |
|----------------------------------|--------------------------|
| <i>Enteromorpha intestinalis</i> | algae |
|
 | |
| <i>Apium graveolens</i> | wild celery |
| <i>Aster tripolium</i> | sea aster |
| <i>Glaux maritima</i> | sea milkwort |
| <i>Plantago maritima</i> | sea plantain |
| <i>Puccinellia distans</i> | reflexed saltmarsh-grass |
| <i>Salicornia europaea</i> | glasswort |
| <i>Samolus valerandi</i> | brookweed |
| <i>Scirpus maritimus</i> | sea club-rush |
| <i>Spargularia marina</i> | lesser sea-spurrey |
| <i>Triglochin maritimum</i> | sea arrowgrass |
|
 | |
| <i>Caenis robusta</i> | may fly |
| <i>Sigara concinna</i> | water boatman |

Designations

SSSI

Significant SSSIs

Sandbach Flashes Ches

Key Nature Conservation Feature: Canals

'Phase 1' habitat classification

- F1.1 Single species dominant swamp
- G1.2 Open water: standing, mesotrophic

Significance National

NVC communities represented

- A2b *Lemna minor* community: *Lemna trisulca* subcommunity
- A4 *Hydrocharis morsus-ranae-Stratiotes aloides* community
- A5b *Ceratophyllum demersum* community: *Lemna minor* subcommunity
- A9b *Potamogeton natans* community: *Elodea canadensis* subcommunity
- A16a *Callitriche stagnalis* community: *Callitriche* spp. subcommunity
- S3 *Carex paniculata* swamp
- S4 *Phragmites australis* swamp and reedbeds
- S5 *Glyceria maxima* swamp
- S7 *Carex acutiformis* swamp
- S8 *Scirpus lacustris* swamp
- S10 *Equisetum fluviatile* swamp
- S12 *Typha latifolia* swamp
- S13 *Typha angustifolia* swamp
- S14 *Sparganium erectum* swamp
- S15 *Acorus calamus* swamp (rare)

Significant Species Groups

- Aquatic macrophytes
- Invertebrate assemblage
- Bats

Significant Species

- | | |
|---------------------------------|----------------------------|
| <i>Hydrocharis morsus-ranae</i> | frogbit |
| <i>Nymphoides peltata</i> | fringed water-lily |
| <i>Potamogeton alpinus</i> | red pondweed |
| <i>Potamogeton compressus</i> | grass-wrack pondweed |
| <i>Potamogeton friesii</i> | flat-stalked pondweed |
| <i>Potamogeton praelongus</i> | long-stalked pondweed |
| <i>Ranunculus fluitans</i> | long-leaved water-crowfoot |
|
 | |
| <i>Gomphus vulgatissimus</i> | club-tailed dragonfly |

Characteristic Species

- | | |
|---------------------------------|----------------|
| <i>Butomus umbellatus</i> | flowering rush |
| <i>Ceratophyllum demersum</i> | rigid hornwort |
| <i>Hydrocharis morsus-ranae</i> | frogbit |

<i>Iris pseudacorus</i>	yellow iris
<i>Sagittaria sagittifolia</i>	arrowhead
<i>Spirodela polyrhiza</i>	greater duckweed
<i>Viviparus viviparus</i>	'winkle' snail
<i>Brachytron pratense</i>	hairy dragonfly
<i>Calopteryx splendens</i>	banded demoiselle
<i>Leuconoe daubentonii</i>	Daubenton's bat
<i>Pipistrellus pipistrellus</i>	pipistrelle bat

Extinct/declining species

<i>Alisma lanceolatum</i>	narrow-leaved water-plantain
<i>Luronium natans</i>	floating water-plantain
<i>Anodonta</i>	swan mussel
<i>Dreissena polymorpha</i>	zebra mussel
<i>Unio pictorum</i>	painter's mussel

Designations

SSSI
SAC

Significant SSSIs

Montgomery Canal (Aston Locks to Keepers Bridge)	Shrops
Newport Canal	Shrops
Prees Branch Canal	Shrops

Key Nature Conservation Feature: Salt subsidence, glacial features and pollen stratigraphy

Geological Conservation Review groups

GCR15 Quarternary stratigraphy sites
GCR2 Caves and karst sites

Significance

National

GCR subgroups

GCR15N Pollen Stratigraphy of England
GCR15J Quarternary of the Pennines
GCR2B Karst

Characteristic landforms/features

Eskers
Kettle holes
Morraines
Deep peat
Subsidence hollows and flashes
Bog oak and pine
Bronze and Iron Age finds

Designations

SSSI
NNR

Significant SSSIs

Aqualate Mere	Staffs
Crosemere and Sweatmere	Shrops
Rostherne Mere	Ches
Sandbach Flashes	Ches
Wybunbury Moss	Ches

Key Nature Conservation Feature: Triassic sandstone exposures

Geological Conservation Review groups

GCR6	Palaeontology sites
GCR11	Permo-Triassic stratigraphy sites
	Minerology

Significance

National

GCR subgroups

GCR6E	Permian-Triassic Reptilia
GCR11b	Permian-Triassic

Significant features

Triassic reptilian footprints
Collapsed breccia

Characteristic features

Cross bedding
Faulting
Mineral migration

Designations

SSSI

Significant SSSIs

Alderley Edge	Ches
Dee Cliffs/Farndon	Ches
Frodsham Railway and Road Cuttings	Ches
Grinshill Quarries	Shrops
Raw Head	Ches
Tyrley Canal Cutting	Shrops

Key Nature Conservation Feature: Fluvial geomorphology

Geological Conservation Review group

GCR1 Active Process sites

Significance

National

GCR subgroup

GCR1B Fluvial Geomorphology of England

Characteristic features

Paleochannels
Meanders
Oxbow lakes
Sand bars and spits
Floodplains
Terraces
Cliffs

Designations

SSSI

Significant SSSIs

River Dane	Ches
River Dee (Holt to Worthenbury)	Ches
River Severn	Shrops