

## Part 4: Management Prescriptions



View across the Wyre Forest: Phil Rudlin

Part 4 outlines the management prescriptions underpinning the headline policies and objectives outlined in the previous section. The management prescriptions detail how habitats across the Wyre Forest management area should be created, restored and subsequently managed to ensure they provide favourable conditions for the species of the Wyre into the future.

Part 4 also details how the policies surrounding people and their interaction with the forest should be delivered via Forestry Commission and Natural England land managers to ensure the forest continues to attract visitors and provides an enjoyable and rewarding experience for all.



## 4.1 Woodland: Management Prescriptions

### Thinning

Conifer, beech and broadleaved stands will be thinned on a regular cycle using a range of Continuous Cover Forestry (CCF) approaches. CCF is an approach to forest management in which the forest canopy is maintained at one or more levels without clearfelling (see thinning map on page 65).

Managed **broadleaved woodland** stands will be assessed for thinning every 10 years and areas of **conifer plantation** every 5 years. Assessments will determine whether the stands are ready to be thinned and the intensity of each thinning intervention.

Management will aim to increase the structural diversity of the stands. Repeated thinning of the stands under this forestry system will open up the canopy, provide opportunities for natural regeneration of both canopy and understorey trees and provide opportunities for enrichment planting.

In **broadleaved woodland** the presence of natural regeneration, age, stability, crown development and levels of seed production of the trees, evidence of deer impacts and the degree of squirrel damage will influence the thinning approach.

Thinning operations will allow sub-dominant broadleaves sufficient light and space to mature, whilst group fellings will release existing advance regeneration or allow for enrichment planting. As long as stability at stand/individual tree level is not affected, younger patches of regeneration will be thinned to favour site native species with trees of good form and vigour retained.

Where broadleaves consist primarily of a single species natural gaps in the canopy will be enlarged through irregular thinning and/or new gaps created by group felling. In all cases the size of gap created will be dependent on slope, aspect, site fertility and crop stability. These gaps will allow sub-dominant broadleaves sufficient light and space to mature whilst group fellings will release existing advance regeneration.

Beech is found planted in uniform stands as well as in mixtures with oak and birch. These stands will be managed to reduce the proportion of beech in the canopy to below 20% and by promoting a permanently irregular stand structure through the creation of gaps in the canopy for natural regeneration or to enable the planting of native species.

In **conifer stands** the quantity, condition, age and distribution of any broadleaf content will also influence the decision on the approach to thinning. For most conifer stands a series of heavy and irregular thinnings will be carried out to create substantial gaps in the tree canopy, to protect remnant features, encourage broadleaved tree regeneration and provide opportunities for enrichment planting.

Conifer stands will be deemed to be 'restored' when the woodland is composed of at least 95% site native trees within the SSSI and 80% for non-SSSI land. Non-native trees may still be present in low numbers, particularly where topography and terrain make their removal difficult or where felling of non-natives would be detrimental to the surrounding native woodland.

A gradual transition from uniformly non-native stands to site native broadleaved woodland will reduce the risk of wind-throw, especially to draw-up native trees that can be adversely affected by dramatic changes to their environment. A gradual transition also reduces the chance of competitive species such as bracken and bramble becoming dominant in the ground layer and suppressing the ancient woodland ground flora and natural regeneration.

### Continuous Cover Forestry

#### Selection Systems

In the selection system, mature trees are removed either as single scattered individuals or in small groups 0.25 – 0.5 hectares in size at relatively short intervals, over a long period of time. The system depends on the natural regeneration of trees into successive age classes over time.

Repeated thinning of the stands under this forestry system will open up the canopy, promote natural regeneration of both canopy and understorey trees and provide opportunities for enrichment planting. A more

diverse structure will provide opportunities for the production of a wider range of timber products.

#### Single Tree Selections

Single Tree Selections are used on established complex old age crops with an established understorey.

The best trees are identified for retention (the final crop) and competitive neighbours are removed during thinning. Final crop trees will be selected based on health, vigour and timber quality and will be dominant or co-dominant in the canopy. These trees should be identified as early as possible in the rotation.

Competitive trees are often larger than average and the thinning operation is likely to result in larger and more irregularly distributed gaps in the tree canopy. The retention of smaller sub-dominant trees will also result in a stand with a more complex age structure. Care must be taken to avoid damage to final crop trees during felling operations.

In some conifer stands it may be appropriate to extend the timescales for final crop trees felling beyond the typical clearfell age to provide an opportunity for structural diversity to develop as the stands approach the 'old growth' stage.

#### Complex (group) Systems

Complex (group) systems require stands to be more windfirm given the exposure group fellings will inflict. Soils must be deep and established crops thinned to CCF regimes whereby crown and root development is established.

Through the felling of small groups and clusters of trees at multiple interventions the complex structure is initiated. The phased felling of groups, and resultant regeneration over a prolonged period will ensure that a complex system of storeys is established over time. Groups may be distributed randomly or evenly across the coupe and multiple interventions can look to extend the size of the gap.

#### Clearfell Systems

##### Strip Systems

A strip felling approach on the leeward wide of the remaining high canopy woodland will be employed sparingly on wind vulnerable crops which may also have a significant landscape impact. The felling of strips along the edge of the crop will promote natural regeneration, provide further opportunities for enrichment planting and diversify the woodland edge habitat.

##### Clearfell

Clearfell involves the felling of all trees from one area of the forest in a single operation. They may be required for the removal of diseased trees or as a requirement of a Statutory Plant Health Notice (SPHN).

In addition, sites supporting species which are likely to produce prolific regeneration in response to thinning operations such as western hemlock, Lawson cypress and western red cedar respond better to clearfelling. Areas of conifer which are due to be restored to open habitat will also be clearfelled to ensure subsequent open space management can be carried out.

#### Control of conifer and beech regeneration

Regeneration of beech and conifer will be controlled to below threshold levels to support the process of restoration to native broadleaved woodland and to minimise the impact of shade-casting regeneration on the ground flora.

Regeneration will be controlled by hand pulling or cutting in the first years of growth or through felling during subsequent thinning operations before the trees produce seed.

Early control is particularly important for those species which regenerate freely and likely to have a greater impact on the restoration of the broadleaved woodland, for example western hemlock, western red cedar and Lawson cypress.

## 4.1 Woodland: Management Prescriptions

### Minimum Intervention

186 hectares or 31% of the ancient semi-natural woodland will be managed as minimum intervention. These stands will provide a refuge for those species which may be adversely affected by the disturbance caused during woodland management and will provide a control against which changes in the managed stands can be monitored.

In these stands management will be limited to the control of and to essential work arising from tree safety inspections.

Areas of ancient semi-natural woodland which are mapped as minimum intervention woodland will not be subject to normal felling operations. In these areas management interventions will be limited to the control of invasive and non native species including rhododendron, Himalayan balsam and sycamore. Essential tree safety works, for example along public footpaths, will continue as normal.

### Protection of sensitive features

During all felling and extraction operations important ecological features including Trees of Special Importance, wet flushes, reptile basking sites and rare flora and areas will be marked up so that damage and disturbance are avoided.

Zones of broadleaved tree regeneration will be identified prior to felling operations and plans developed to protect these, including clear identification of regeneration zones and choice of suitable felling and extraction methods and machinery.

Archaeological features will be clearly marked prior to felling operations to ensure they are not damaged by vehicles and machinery. Where necessary advice will be sought from historic environment advisors on the importance and sensitivity of specific features.

Permanent extraction racks will usually be established at 20 metre intervals and wherever possible all forestry machinery will be restricted to these racks to minimise disturbance of ground vegetation and to restrict compaction of the woodland soils.

### Trees of Special Interest (TSI)

Trees of Special Interest (TSI) within the Wyre Forest include ancient, veteran, champion, historic, notable or rare trees of a variety of different species. Management of TSI should follow Forestry Commission Operations Instruction No. 31, Trees of Special Interest and Forest Operations which includes the requirement to protect TSI root protection zones from vehicles and machinery compaction to at least 5 metres beyond the tree canopy.

Characterful broadleaved trees showing complex branching forms, evidence of decay, nest holes or other veteran tree features are likely to provide a range of high value veteran tree habitats and will be retained during felling operations.

In addition mature trees with the potential to develop into veterans, both within the high forest canopy and growing along open rides and in coppice coupes, will be identified and marked prior to any felling/thinning operation, seeking to ensure that all of the site native tree species are represented as veterans in the future at a rate of at least 1-2 per hectare.

Where necessary, selective 'halo' thinning should be carried out around veteran and potential veteran trees whose canopies are restricted by the growth of surrounding trees. A gradual, progressive approach should be taken to minimise sudden exposure to wind and sun which can cause stress to the tree, damage lichen and bryophyte communities and increase the risk of wind-blow. The long term aim should be to free the crown of the tree to 5m beyond the drip line.

Some of the conifers planted in the forest have become recognised features of the forest landscape. Examples include the 'avenue' in Hitterhill Coppice, scattered Corsican pine and Douglas fir in Hitterhill and Town Coppices, Scots Pine along the Dowles Brook and the 'giant' Douglas fir around Callow Hill. These trees will be retained for their aesthetic and landscape value.

A small number of planted true service trees (*Sorbus domestica*) are located in the forest. This rare species should be managed on an individual tree basis.

### Deadwood

A range of both standing and fallen deadwood should be encouraged to accumulate providing greater continuity of deadwood habitat types in varying degrees of decay. Deadwood volumes will be enhanced in all stands but will tend to be higher in broadleaved woodland. A diverse range of deadwood should be retained including whole dead trees, crown deadwood from a variety of different species, snags of varying height, as well as brash created through thinning and felling operations.

In stands with low volumes of deadwood, or in which the variety and quality of deadwood habitats is particularly low the creation of standing deadwood through ring-barking broadleaved trees and/or the retention of larger diameter material following broadleaved felling operations will be considered. All safe standing deadwood of any species, that does not pose a threat to public safety will be retained.

### Establishment

#### Brash

Brash produced during thinning operations in broadleaved stands will be retained wherever possible as part of the deadwood resource. Following conifer harvesting or where brash levels are impacting on the recovery of natural regeneration and ground flora or preventing enrichment planting from taking place brash will be raked into piles or windrows and/or burned.

#### Enrichment planting

Gaps created through group fellings within conifer, beech or native broadleaf woodland to promote the restoration of site-native broadleaved woodland may be enhanced through enrichment planting to increase the diversity of tree species within these stands.

Tree species such as small-leaved lime, wild service tree, yew, wild cherry, aspen, rowan and alder as well as understorey species such as crab apple, hawthorn, blackthorn and hazel will be planted. Supplementary planting of shrubs such as guelder rose, dogwood and alder buckthorn will provide added diversity. Hornbeam will also be introduced as a minor element in some of the woodland stands, reflecting changes in distribution as a result of climate change and adding further diversity.

In stands undergoing PAWS restoration species mixes will depend on the proportion and species of broadleaved trees already present and is likely to include significant proportions of oak in addition to those species listed above.

Understorey trees and shrub species will be planted in small fenced enclosures of 0.25 hectares. A number of these enclosures should be positioned on the edges of rides to improve the ride structure for butterflies and woodland birds.

Priority for enrichment planting will be given to those stands in which natural regeneration has failed to deliver a suitable density or diversity of establishment of young trees.

## 4.1 Woodland: Management Prescriptions

### Clearfell Restocking

On clearfell sites mixed plantings of site native species will normally include planting of 65% oak as the primary component, with the remaining 35% being made up of small -leaved lime, wild cherry, wild service, hornbeam and other native species.

### Tree Stock

Planting stock will be required for all of the trees on the site native species list. The ordering of tree stock will need to be managed to minimize the possibility of introducing tree diseases into the forest from the introduction of planting stock. In all cases tree stock will only be purchased where there is full knowledge of the origin of the tree seed where the nurseries are registered and of the chain of custody from seed collection to delivery is available. Arrangements with tree nurseries will include specifying exemplary biosecurity to cover growing mediums and prevention of disease transmission from other trees in the nursery.

### Forest Roads and Infrastructure

To reflect an increase in the intensity of woodland management and joint working across the whole management area an assessment of the forest's infrastructure will be carried out by the Forestry Commission civil engineers.

Based on the engineers recommendations for maintenance and upgrade of the current infrastructure a strategy outlining required resource and funding mechanisms will be developed.

## 4.2 Coppice: Management Prescriptions

### Coppice Restoration

Coppice restoration will involve the staged re-establishment of an extensive network of 0.5 hectare plots in both broadleaved and conifer stands (see felling maps).

Felling operations to create coppice coupes will be marked to retain all native broadleaved trees and standing deadwood. Particular care will be taken to promote oak trees which may provide a seed source to support the regeneration of the coupe.

Brash will be windrowed or stacked to reduce its impact on natural regeneration or to allow enrichment planting to be carried out. A proportion of the brash may be burnt.

### Re-stocking

Where there is insufficient seed source to support the natural regeneration of oak on a coppice restoration site, establishment will be encouraged by dibbing in acorns at regular 0.9 metre spacings and /or restocking with oak in 1.5m tubes at 4m centres in groups of 5-20, at 0.9m spacing.

A suitable density of well-established oak and on some suitable sites hazel stems will be required before coupes can be moved into management under a coppice cycle.

### Fencing

It will normally be necessary to fence coppice coupes until regeneration/ re-growth is sufficiently robust to resist the impacts of deer browsing. Fencing will be removed after 6 years/ when regrowth reaches 2 metres in height.

A fence height of 1.5 metres should generally be sufficient to prevent significant damage by deer and reduces the visual impact and cost of providing full height exclusion fencing. The impacts of deer on regenerating coupes will require monitoring and if necessary full height deer fencing may be required.

### Coppice Management

Once native broadleaved trees are established they are likely to require a degree of re-spacing to prepare the coupe for management as rotational

coppice.

Regeneration will be re-spaced to approximately 1.5 metres to promote the development of the retained stems. Re-spacing will aim to remove native trees, favouring oak over birch and retaining any other native broadleaved trees which have established on the coupe.

The first coppice cycle will be initiated when the majority of stems reach a diameter at breast height (dbh) of at least 10 cm.

### Coppice Cycles

The coppice rotation should be of sufficient length to ensure that the ground flora is substantially suppressed, giving a minimum of 30% of bare ground across a whole coupe. This will normally require at least 70% canopy closure.

In practice coppice cycles will vary between 12 and 30 years to provide a broad range of wood products, and to allow sufficient flexibility to maintain continuity of the habitats associated with the early stages of the coppice cycle across the Wyre forest.

### Standard trees

Where mature site-native trees are present within proposed coppice coupes a proportion will be retained as standard trees at a density not exceeding 30 per hectare (ie. around 15 in each coppice coupe) across a range of age classes. These standard trees will provide seed sources to encourage natural regeneration. In addition they will provide habitat diversity and structure to the coppiced areas.

### Hazel coppice

Where coppice coupes are dominated by hazel, hazel coppice should be encouraged in preference to oak. Hazel coppice will also be considered as an alternative to oak on coppice plots where there is no seed source to enable the natural regeneration of oak. In these instances a decision to plant hazel rather than oak may be taken based on factors including soil conditions and aspect with the aim of creating hazel coppice over 20% of the mapped extent of coppice.



# 4.3 Wood Pasture: Management Prescriptions

## Woodland management

A programme of thinning, open habitat creation and enrichment planting will be carried out within the wood pasture areas (see Part 5 Management Proposals).

Particular priority will be given to halo thinning around mature broadleaved trees with the intention of encouraging the development of large veteran trees in the future. Thinning operations around suitable younger trees will help ensure the crown development and to provide future veteran trees and long-term continuity of habitats.

## Cattle grazing

“Invisible fencing” comprising a buried cable emitting a radio signal which is received by collars worn by the cattle will be used to keep the cattle within the areas of wood pasture. The collars deliver an electric shock if the cattle attempt to cross the buried cable. The electric shock is preceded by an audible warning to which the cattle will be trained to respond. Where the wood pasture areas are within 100 metres of a public highway the invisible fence will be supplemented with a stock fence set back at

least 20 metres from the roadside.

Manage stocking densities to deliver a diversity of habitat structure including high quality heathland, a flower rich woodland ground flora, bramble and thorn scrub and patches of tree regeneration with tree canopy cover varying between 20-40%.

Stocking rates will need to be flexible and focussed on the delivery of the wood pasture objectives. Monitoring of the tree, scrub and ground layer composition and structure will help inform future stocking densities.

The grazing season will be between the beginning of June and the end of November. The provision of concentrates may encourage cattle to eat coarser vegetation and dead material which they would otherwise avoid. Regular relocation of concentrate licks may also provide a method of shepherding the cattle to different parts of the site.

The following table summarises the NNR notified features of woodland.

## 4.3.1 Woodland: Notified Features

Feature	Section 41 Habitat Type or Geological Site Type	Specific Feature	Legal Site Designations and other classifications							
			Explanation of Feature/ Ranking	SSSI	EPS	S41	Rare	Scarce	Prot	NCA
1	Lowland mixed deciduous woodland	W10 (pedunculate oak-bracken-bramble) / W16 (oak-birch-wavy hair grass) woodland	Oak woodland of (east-west-lowland) transition zone	Y		Y				Y
2		W8 (ash-field maple-dog's mercury) woodland	Ash woodland of valley/alluvial soils	Y		Y				Y
3		W4 (downy birch-purple moor grass) / W7 (alder-ash-yellow pimpernel) woodland	Wet woodland	Y		Y				Y
4		Woodland flora	Inc. narrow-leaved helleborine, Liverworts, Mosses, Lichens, Fungi	Y		Y	Y	Y		
5		Breeding bird assemblage (woodland)	Inc. pied flycatcher, wood warbler, redstart, tawny owl, sparrow-hawk	Y		Y	Y	Y	Y	
6		Breeding bird assemblage (coppice)	Inc. tree pipit, tree sparrow, nightjar, woodcock, hobby.	Y		Y	Y	Y	Y	
7		Breeding bird assemblage (coniferous woodland)	Inc. goshawk, crossbill, firecrest, goldcrest, siskin.	Y		Y	Y	Y	Y	
8		Breeding bird assemblage (woodland edge)	Inc. hawfinch, barn owl, yellowhammer, spotted flycatcher, woodpeckers.	Y		Y	Y	Y	Y	
9		Small mammals	Inc. dormouse, polecat, bank vole and field vole	Y	Y	Y			Y	
10		Bats	Inc. Daubenton’s, long-eared, noctule, pipistrelle and whiskered	Y	Y	Y			Y	
11		Pearl bordered fritillary				Y		Y		
12		Small pearl bordered fritillary				Y		Y		
13		Wood white				Y		Y		
14		Drab looper				Y	Y			
15		Common fanfoot				Y	Y			
16		Invertebrate assemblage A2 – Wood Decay (Inc. A211 heart-wood decay, A212 bark and sap-wood decay and A213 Fruiting fungal bodies)	Beetles, crane flies, hoverflies and moth larvae	Y		Y		Y	Y	
17		True service tree (Sorbus Domestica)								

## 4.4 Resilience: Management Prescriptions

### Fallow and Muntjac Deer Management

Fallow deer management will be carried out across the management area by the Forestry Commission Wildlife Ranger to annual targets agreed as part of the wider Deer management Society cull.

The network of high seats across the forest will be maintained and developed to facilitate the cull of muntjac deer. There will be no target or cap for the numbers of muntjac deer culled each year.

### Grey Squirrel

In partnership with the Wyre Landscape Partnership, develop a squirrel control programme across the Wyre Forest management area.

Investigate the feasibility of reintroducing pine marten to the forest to help with the control of grey squirrel.

### Invasive Species Control

Rhododendron over 1.5m high will be cut and the brash burnt. Where possible stumps and roots will be winched out.

Locations of cut rhododendron will be recorded and follow-up spraying will be carried out on an annual basis using Glyphosate and a suitable adjuvant, until no further regeneration occurs.

Young self-seeded rhododendron and any remaining roots will be manually pulled.

Himalayan balsam will be controlled by hand pulling plants in July and August.

Japanese knotweed will be controlled by stem injection with Glyphosate.

### Tree Provenance

Within the SSSI, all tree stock will be from seed gathered locally to the Wyre Forest. Where necessary stands within the forest will be registered as seed stands to facilitate this process.

Outside the SSSI, up to 40% of the tree stock will be sourced from other locations to increase genetic diversity. A proportion of trees should be sourced from more southerly latitudes. The Wyre is located at latitude of 52.40 degrees north, the target areas of sourcing a proportion of tree stock would be no more than 3-4 degrees south. In reality this would mean sourcing tree seed from areas such as the New Forest at 50.86 degrees and potentially the north west of France.

### Management of tree disease

Practical biosecurity measures to reduce the risk of the transmission of tree diseases from one site to another will be encouraged by staff and contractors including the requirement to clean and disinfect boots, vehicles and equipment.

Concerted efforts will be made to inform visitors such as naturalists, mountain bikers and horse riders of the issues of tree disease and of steps that they can take to reduce the risk of carrying diseases between sites will be made.

### Dothistroma Needle Blight or Red Band Needle Blight (RBN)

RBN mainly affects Corsican pine and can severely reduce growth rates. Effects are managed through heavy thinning of the stands to increase air flow through the remaining crop.

First thinnings will respace crops to between 3 and 5 metre spacing and in subsequent thinnings 5-8m, 8-12m, 12-15m and 15-18m spacing will be achieved respectively.

During thinning operations opportunities will be taken to include group felling in order to create space for enrichment planting of native species or to manage priority habitats.

### Phytophthora ramorum (PR)

*Phytophthora ramorum* is a notifiable disease and is dealt with by felling the infected area under a Statutory Plant Health Notice (SPHN) issued through FERA and the Forestry Commission.

Felled stands will be restocked in line with the overall restocking policy and prescriptions.

Where larch forms a secondary component of a crop, thinning will aim to remove larch components at an accelerated rate.

### Ash Dieback or Chalara fraxinea

If Chalara is recorded in the Wyre Forest, ash will be retained in the hope that it will be resilient to the disease.

Infected sites will not be clear-felled but managed to help identify potentially resistant strains.

There will be no restocking with ash although ash regeneration will be accepted.

### Oak 'Dieback' or 'Decline'

Oak will be diversified through group felling to encourage and promote a diverse range of native species (as discussed in the woodland prescriptions) or through enrichment planting where necessary.

Natural regeneration and newly planted stock should be protected where necessary using tree guards or deer fencing.



## 4.5 Open Habitats & Scrub: Management Prescriptions

### Lowland Heath

Management of heathy vegetation sites will seek to maintain a diverse age structure to the heather, manage scrub and bracken at appropriate levels and prevent succession to secondary woodland.

Wherever practicable a dwarf shrub community with a varied and dynamic age structure will be maintained by grazing the core open habitat areas. Initially this grazing is likely to be limited to those open habitat patches which fall within the larger wood pasture areas along with the two or three largest areas of permanent open habitat.

Grazing by cattle may reduce the frequency of birch regeneration but further management to cut and stump treat birch is likely to be required and will need to be significantly more intensive on the patches of open habitat not grazed by cattle.

In some instances cutting with collector flail or brush cutter may offer a good solution to maintaining high quality and structurally diverse dwarf shrub/heathland habitats.

### Lowland Heath Scrub

Scrub will be managed on a rotational basis to maintain a balance between dense areas of young scrub and core areas of mature scrub. Management will encourage a diverse species mix, including nectar sources on mature bramble, gorse and broom and food sources on trees such as hazel, rowan, hawthorn and blackthorn.

Management will seek to maximise the scrub edge by creating an uneven boundary, including scallops of various sizes, to provide a wide range of micro-habitats.

Scrub will be managed through a combination of cutting by tractor with collector flail and manually with brush cutter and hand-tools to maintain a diverse structure and prevent encroachment.

### Bracken

Bracken control is also likely to be required in many of the heathland areas, except those on the thinnest soils. This will normally require spraying, providing suitable fern specific herbicides are available, on rough heathy terrain where other methods of control are not practical.

In the absence of a suitable targeted herbicide it may be possible to control some areas of bracken using a more generalist herbicide applied with a weed wiper.

On easier terrain bracken rolling, ideally at least twice a year, may offer an alternative treatment to reduce the vigour of the bracken.

### Adder hibernacula

The open habitats of heather and scrub will provide important adder habitat and it is important that these sites are managed sensitively.

Adder hibernacula should be recorded on constraints maps and the use of vehicles and machinery should be avoided. The retention of more dense stands of bracken around hibernacula sites may also be appropriate.

The following table summarises the NNR notified features of dwarf heath shrub.

Fea- ture	Section 41 Habitat Type or Geologi- cal Site Type	Specific Feature	Legal Site Designations and other classifications							
			Explanation of Feature/ Ranking	SSSI	EPS	S41	Rare	Scarc e	Prot	NCA
25	Dwarf Shrub Heath	H12 heather-bilberry heath	Lowland heathland	Y		Y				Y
26		Reptile populations	Adder, common lizard, grass snake and slow-worm	Y		Y			Y	
27		Invertebrate assemblage F003 - Scrub heath and moorland	Beetles, spiders, butterflies and moths, flies and true bugs	Y						

## 4.6 Woodland Rides & Railway: Management Prescriptions

### Rides

Nectar sources in flower rich short sward and scrub will be maintained. Management will need to be sensitive to a wide range of habitat demands ranging from basking sites for reptiles and invertebrates, to dormouse and rare breeding bird nesting sites and wood ant nests

Rides will be created and managed to maintain a gap in the tree canopy of at least 20 metres along most of their length.

Veteran and potential veteran trees and significant trees such as wild service will be retained at wide spacings within the managed ride area. In locations where the canopies of understorey tree species create bridges across rides these will be retained as aerial links for dormice.

Rides will be swiped or flailed on rotation to maintain open habitats of varying width and to create edges with varied age structure.

A central area of 4-6 metres in width will be cut each year with arisings removed. Straight edges between mown sward and scrub will be avoided. Edge length, micro-climates and sheltered pockets will instead be created along a wavy edge between ecotones.

In addition unevenly shaped, south facing scallops of around 0.1 ha will be maintained by rotational cutting with arisings removed.

The sward in the mown areas of the rides will be enhanced where necessary through re-seeding with seed sourced from the flower rich meadows within the forest and/or through the use of lime to reduce the acidity of the soils and promote a greater diversity of flowering plants.

Further management will consist of rotational scrub and tree regeneration control to create a complex structure comprising species rich grassland, heathy vegetation and scrub. An element of bare ground, created by scarifying the surface will provide an additional important component of the ecotone habitat for invertebrates.

Large clumps of mature bramble will be retained outside the mown areas as nectar sources along with young (below 3 metre) oak and birch regeneration. Understorey trees and shrubs, (hazel, hawthorn, guelder rose, blackthorn, rowan, wild rose, broom, etc.) will be retained along ride edges to form a progressive structure leading up to the high woodland canopy and to provide fruit and nectar sources. Where appropriate these understorey species may also be planted on the ride sides as part of the enrichment planting of the wider woodland.

Light bracken cover can be beneficial providing a canopy for violets and other woodland flowers. Management of bracken by cutting, rolling or spraying may be necessary where dense stands become too extensive.

A number of the proposed rides contain mature oak which provides an important seed source for the restoration of the adjacent woodland. These oak trees will be retained for the foreseeable future, possibly subject to some thinning as appropriate. Where practicable the broad approach to ride management, ie. mowing and scrub management, will be carried out around these trees.

### Railway

The management of the railway embankments will be broadly similar to that of the rides. A 3-4 metre width either side of the track will be maintained as short, species rich sward, including rushes and sedges by annual cutting with a flail mower.

A minimum of 60% of the south facing embankment will also be maintained as short sward by the cutting of scallops on a 2 – 3 year rotation.

Scrub on the north facing embankment will be managed to prevent shading of the southerly embankment, areas of heather, bilberry, gorse and broom will be retained.

Understorey tree species (hazel, hawthorn, guelder rose, blackthorn, rowan, wild rose) will be retained and treated as coppice cut on an approximately 10 year rotation. Aerial links for dormice will also be retained where possible.

High canopy trees (birch and oak) will be removed from the embankments at a maximum age of 10 years and stump treated to prevent re-growth.

Mature trees above the north facing embankment of the railway will be selectively removed to increase the light levels along the length of the disused railway line.

# 4.7 Meadows & Orchards: Management Prescriptions

## Grazing

At the end of the growing/grazing season the majority (80%) of the grassland will be grazed to a height of 2-5cm, but will contain a complex mosaic of taller vegetation up to around 15cm, including frequent remaining dead plant stems and seed-heads to provide over-wintering sites for invertebrates such as micro-moths, beetles and parasitic wasps.

Low stocking densities are more likely to provide the complexity of structure which is beneficial to invertebrates, small mammals and birds. A stocking density of around 1.5 livestock units/hectare is probably appropriate (1 livestock unit is approximately equal to 1 beef cow or 7 ewes). Grazing with higher stocking densities over shorter periods is likely to be particularly damaging to invertebrate populations which have complex requirements for vegetation of various heights at different stages of their lifecycle.

Cattle are the preferred grazing animal. Cattle are selective grazers and produce the most varied sward structure as well as producing small areas of bare ground through trampling. Additional grazing with sheep may be beneficial in creating areas of evenly cropped short sward, where finer grasses are dominant, amongst taller more coarse vegetation.

Supplementary feeding of livestock will not be permitted. Enrichment of the low nutrient soils of the meadows would result in an increase in competitive species and a significant reduction in the species diversity of the sward.

Light trampling of ditch and stream edges and wet areas is likely to be beneficial, reducing the dominance of competitive species and creating bare ground micro-habitats for invertebrates, however no significant poaching of the grassland area will be permitted.

Ivermectin, a broad spectrum anti-parasitic drug for cattle, is excreted in dung and reduces the numbers and variety of dung associated fauna. This and other potentially damaging drugs, including organophosphates must not be given to cattle grazing the meadows.

## Hay cutting

In appropriate areas hay cutting offers an effective supplement to the grazing regime promoting a distinct associated flora and invertebrate assemblage. Areas suitable for hay cutting, including meadows at Lodge Hill and Bell Coppice, will be cut for hay at least two years in every three to provide suitable conditions for the associated invertebrate assemblage.

Hay should be cut to a height of 2-5cm. Cut material will be field dried for at least 48 hours and turned to encourage the shedding of seeds. The hay must then be baled and removed from the meadows within two weeks of cutting. The presence of ant hills and/or wet flushes rules out the mechanical cutting and baling of hay from many of the grassland sites.

Cut areas will be aftermath grazed with cattle during the autumn and early winter to achieve a sward height of 2-5cm over approximately 90% of the area at the end of the growing season. Poaching of the grassland area should not be permitted and all stock should be removed by the end of November.

## Scrub and hedges

Scrub will be managed to maintain a cover of less than 10% of the grazed areas and to maximise the scrub/grassland edge and to provide sheltered, sunny micro-habitats.

Rotational management of the scrub will provide a complex height structure in scattered thickets including occasional mature shrubs and understorey trees. A diversity of species will be maintained, including flowering and fruiting plants to provide nectar and food sources. This will maximise the value of the scrub habitats for invertebrates, small mammals, reptiles and nesting birds.

Where practicable hedges should be maintained around meadow boundaries. A diverse species composition should be maintained in hedgerows to provide food and nectar sources. Maintained hedges should be cut during the late winter in alternate years. Occasional larger trees in the hedgerows should be retained.

Hedges may be re-established along suitable sections of meadow boundary by laying over-stood hedge plants and planting to close any gaps.

Other section of old hedges are more suitably managed as mature understorey trees, for example some sections of hazel hedge have developed into mature trees providing ideal dormouse habitat. These sections will be subject to minimal management intervention, but some rotational coppicing may be required to prevent the collapse of coppice stools.

## Orchard trees

Where is it possible to carry out management of veteran fruit trees without damage or loss of decaying and hollowed limbs, restorative pruning will be carried out to stabilise, balance and if necessary crown reduce trees to lower the risk of wind-throw and to prevent the break-out of branches.

Caution needs to be exercised in carrying out extensive pruning of these veteran trees, many of which have poor vigour, and the programme of restorative pruning will extend over many years.

Branches removed during this management will be left close to the base of the trees from which they were removed, along with any naturally fallen dead wood.

A substantial number of orchards trees have been planted over the previous five years in the orchards at Coopers Mill and Lodge Hill and on Simon’s Orchard in Hitterhill Coppice. These trees will require formative pruning for a number of years and any losses will need to be replaced.

The value of the orchard habitats will be enhanced by increasing the numbers of fruit trees in the woodland habitats, especially those surrounding the existing orchards and within areas of wood pasture. In these areas enrichment planting will include a greater proportion of open-grown crab apple and wild cherry.

The following table summarises the NNR notified features of meadows.



# 4.7.1 Meadows: Notified Features

Feature	Section 41 Habitat Type or Geologi- cal Site Type	Specific Feature	Legal Site Designations and other classifications							
18	Neutral Grassland		Explanation of feature/ Ranking	SSSI	EPS	S41	Rare	Scarce	Prot	NCA
		MG5 (crested dog's tail-common knapweed) grassland	Lowland hay meadow	Y		Y				Y
19		Hedgerows		Y		Y				Y
20		Traditional Orchards	Orchard - grassland mix	Y		Y				
21		Grassland and orchard flora	Inc. green-winged orchid, fungi	Y				Y	Y	
22		Narrow bordered bee-hawk moth				Y	Y			
23		Noble chafer				Y	Y			
24		Invertebrate assemblage F112 – open short sward	Beetles, true bugs, butterflies and moths	Y						

# 4.8 Wet Flushes, Streams & Pools: Management Prescriptions

## Wet Flushes & Seepage

To accommodate the differing invertebrate requirements for light and shaded conditions where seepages occur within woodlands high canopy trees will be removed on and around the flush and understory trees and scrub managed to ensure that at least 60% of the area of any single wet flush is free from shade. Tree regeneration will be controlled at early stage.

Areas of seepage and wet flush which occur within areas of limited intervention woodland will generally be managed according to this approach. Accumulated fallen dead wood will be retained and where appropriate material from felled trees will be stacked towards the edges of the flushes.

Surveys of the flora and invertebrate assemblage associated with each wet flush will ensure management is tailored to the character of individual flushes. Additionally a phased approach to management will be taken resulting in only a small proportion of each flush being managed in any one year.

Wet woodland surrounding wet flushes should be managed as short rotation coppice (<10 years). Grazing with livestock will not generally be practicable, but where this is an option, such as the Great Bog, grazing cattle at a low stock density will be beneficial, preventing tree regeneration, reducing the proportion of competitive rushes and sedges and creating small areas of bare ground through trampling.

Where possible works will be carried out to restore the natural hydrology and to create or enhance wetter areas on the generally free draining soils of the forest.

## The Dowles Brook and its Tributaries

Coppicing of small numbers of bankside alders should be undertaken on a long rotation, selecting single trees or stools, well apart from others coppiced in recent years to create light and shaded conditions. Dead trees at the sides of streams should be retained standing. Aside from this limited coppicing it is generally acceptable for streams to remain shaded ensuring suitable habitat for species such as native Crayfish is maintained.

Fallen trees within streams should be left in position as they play a crucial role in slowing the flow, allowing pools to form and maintaining the dynamic character of the streams, allowing the characteristic erosion and accretion geomorphology to take place.

Thinning and clearfell operations adjacent to streams should be carefully planned to avoid sudden and extreme changes in light levels and to ensure that species such as otter which use the riparian habitat to rest and breed are not disturbed.

No management which may interfere with the natural channel morphology and flow rates in the streams, resulting in a reduction in diversity of refuge and foraging habitats will be undertaken.

If possible measures should be taken to control the spread of alien species and to reduce their numbers.

Crayfish plague can be introduced by a variety of routes, including contaminated equipment (nets, boots, etc.) stocked fish from infected waters, and colonisation of site by non-native crayfish species. Outbreaks of crayfish plague will typically result in 100% mortalities, except in isolated headwaters. Any equipment used for management or monitoring should be disinfected or thoroughly dried. Ideally dedicated equipment should be reserved for use only in native crayfish streams.

As far as is practicable management intervention in the form of engineered infrastructure will be avoided and the streams allowed to develop naturally functioning systems of woody debris formation, bank-side erosion and deposition. The accumulation of woody debris, careful management of stream side trees and planning of felling operations (following the UK Forestry Standard (UKFS) Guidelines: Water) will avoid pollution of water courses and enhance water quality in the catchment.

## Pools and Reservoirs

Intervention in the natural processes of siltation and succession is not generally desirable and if any dredging/de-silting is carried out it should be limited to 30% of the area of the pool in any one year.

The creation of new pools and scrapes or reinstatement of historic pools that have silted up entirely will be considered where the opportunity exists without causing damage to valuable successional habitats and with regard to European Protected Species such as great-crested newt which may be using the site.

Marginal vegetation of the permanent pools retained by dams is a valuable habitat. Where dredging is required this should be carried out over no more than 30% of the area of a water body at any one time, recognising the value of vegetation and bare ground at pool margins for a range of invertebrates.

The present infrastructure of dams, culverts and pools will be maintained to ensure they function effectively and safely. Where possible measures will be taken to remove engineered structures and begin the process of restoring the natural hydrology of the forest.

Any maintenance that is required will be informed by an in-depth understanding of the status and habitat requirements of white-clawed crayfish populations and works carried out on dams and culverts will be designed to ensure that flow rates both above and downstream are maintained and suitable levels for crayfish.

The following table summarises the NNR notified features of wet flushes, streams and pools.

## 4.8.1 Wet Flushes, Streams & Pools: Notified Features

Feature	Section 41 Habitat Type or Geological Site Type	Specific Feature	Legal Site Designations and other classifications							
			Explanation of Feature/Ranking	SSSI	EPS	S41	Rare	Scarce	Prot	NCA
28	Fen, Marsh and Swamp	M23 (soft/sharp flowered rush-marsh bedstraw) rush-pasture / M24 (meadow thistle-purple moor grass) fen meadow	Rush pastures	Y		Y				
29		M27 (meadow sweet, wild angelica) mire	Lowland fens	Y		Y				
30		Invertebrate assemblage W126 - Seepage	Soldier and crane flies, caddis flies, beetles and snails	Y		Y				
31	Rivers and Streams	Rivers		Y		Y				Y
32		Otter		Y	Y	Y			Y	
33		Breeding bird populations (streams and pools)	Inc. kingfisher, dipper, grey wagtail.	Y		Y		Y		
34		Fish populations	Including brook lamprey, brown trout and salmon	Y		Y			Y	
35		Atlantic white-clawed crayfish		Y		Y			Y	
36	Standing Open Water and Canals	Ponds		Y		Y				
37		Amphibian populations	Including common toad, great crested newt	Y	Y	Y			Y	



# 4.9 Landscape & Historic Environment: Management Prescriptions

Restore a more intimate mosaic of well-connected ancient semi-natural woodland and open habitat to ensure the unique landscape character of the Wyre Forest is maintained and enhanced into the future.

The restoration of open habitats / wood pasture from forestry plantations and subsequent regeneration/replanting and infrastructure will be carefully managed to ensure disturbance to surface archaeological features and structure, and their associated below ground deposits does not occur.

The available mapping of archaeological features will be used to inform all forestry and habitat management operations. Further work will be undertaken with the Archaeology Service and Historic Environment records of Shropshire and Worcestershire Councils to develop detailed

guidance on the management of identified features and specific management plans for those features, or groups of features identified as being of greater significance.

The two Scheduled Ancient Monuments will be conserved and managed in accordance with management plans agreed with Historic England.

Key archaeological features will be managed appropriately to preserve their structure and where possible to reveal the historic landform.

Support will be given to further research into the historic environment in the forest and opportunities sought to interpret the history and archaeology of the forest to visitors

Feature	Specific Feature		Legal Designations				Other
		Explanation of Feature/Ranking	World Heritage Site	Scheduled Monument	Listed	Register Historic parks and Gardens	Other
38	Later prehistoric and Romano-British settlement and communications	Enclosures and tracks					Y
39	Medieval settlement, farming and land-management	'Ridge and furrow' earthworks, relic park boundaries, banks, ditches and tracks					Y
40	Post-medieval industry and forest management	Coppice banks, timber extraction tracks, saw pits, quarries and clay pits, charcoal hearths, 'bell pit' mines associated with coal extraction, disused railway line, watermills, farmstead buildings					Y

# 4.10 Species Management: Management Prescriptions

Identify the sites of as many adder hibernacula as possible and explore measures to prevent disturbance to these areas including zones of exclusion to machinery and vehicles.

Identify populations of white-clawed crayfish and explore measures to reduce the risk of disease transmission through managing public access or through the translocation of crayfish to more secure ‘sanctuary’ sites.

Ensure sites are recorded on constraints maps and forest management, recreation and civil engineering staff as well as contractors are aware of their presence and habitat requirements before operations proceed.

Ensure new recreation trails are carefully planned to minimise disturbance to key populations within the forest and to ensure that quiet areas relatively free of public pressure are maintained through encouraging people to use other areas of the forest.

Support the managed reintroductions of key species of Lepidoptera (for example Kentish Glory and Argent and Sable moths and the High Brown Fritillary Butterfly) which have become extinct from the forest but for which suitable habitat is being restored.

Carry out feasibility studies on further reintroductions of keystone species including pine marten, beaver and red squirrel.

## 4.11 Site Enhancement & Acquisition: Management Prescriptions

In general land which is primarily of forestry value and which extends or improves connectivity of the main woodland blocks will be considered for purchase by the Forestry Commission.

Natural England will look to strengthen existing tenure arrangements, securing longer term, more comprehensive lease agreements as current leases expire.

Natural England will consider acquisitions through lease or purchase of land of high conservation value, especially blocks of ancient semi-natural woodland, traditional orchards and unimproved pasture which extend the existing habitat networks or improve connectivity across the habitat mosaic.



## 4.12 Visiting the Forest: Management Prescriptions

### Wyre Gateway Centre

Callow Hill will be managed as the main gateway to the forest. A 'Master-Planning' exercise is underway which will include a comprehensive review of the facilities and buildings at Callow Hill. The planning exercise may result in significant re-development of the car park, café, toilet and visitor information facilities. Any proposed re-development is likely to be carried out over a 2-5 year timescale.

Visitor information at Callow Hill will be complemented by improved pre-visit information available on-line and through the production of a fold-out map of the forest providing full information on the trail network and visitor facilities in one place.

Information for visitors is available on-line and at all car parks. Publicity and information will be reviewed and developed to provide a better understanding of what the forest has to offer to visitors and encourage sustainable recreational use of the forest.

### Recreational Trails

The network of maintained and way-marked recreational trails will be rationalised and upgraded. Two walking trails will be developed around Callow Hill to include improved surfaces and the installation of activity and play areas. These trails will be designed to meet the needs of users with impaired mobility including wheelchair access and will also extend the usability of the access network to those with pushchairs and buggies. In addition the family cycling trail will be upgraded to improve surfaces and reduce gradients making it accessible to a wider range of visitors. The detail of these developments will be included in the master planning exercise for Callow Hill.

Elsewhere in the forest the way-marked trails from Dry Mill Lane, Coppice Gate and Hawkbath car parks will be removed. In the place of these trails a number of 'destination' points will be defined at key features and viewpoints. The destinations will be identified on maps in car parks and indicated on finger-posts.

The 'Butterfly Trail' starting at Dry Mill Lane will be maintained as a series of interpretation panels with a supporting down-loadable leaflet. This trail will be identified on the map in Dry Mill lane car park and a marker post installed at the start of the trail. Other trails in the forest including the GeoPark Way and Sustrans route 45 will be similarly identified on orientation maps and finger posts.

Opportunities will be sought to improve linkages to Cleobury Mortimer, Bewdley and the wider countryside providing a more integrated access network which encourages access into the forest on foot, bike and horse.

### Horse Riding

The current permit arrangements for managing access for horse riders will be continued, working with the Worcestershire Bridleway and Riders Association. The permit scheme provides access to a series of way-marked riding trails and all of the surfaced forest roads. Consideration will be given to opportunities to extend the riding network and create further linkages between riding routes cross the forest.

### Wild Trails

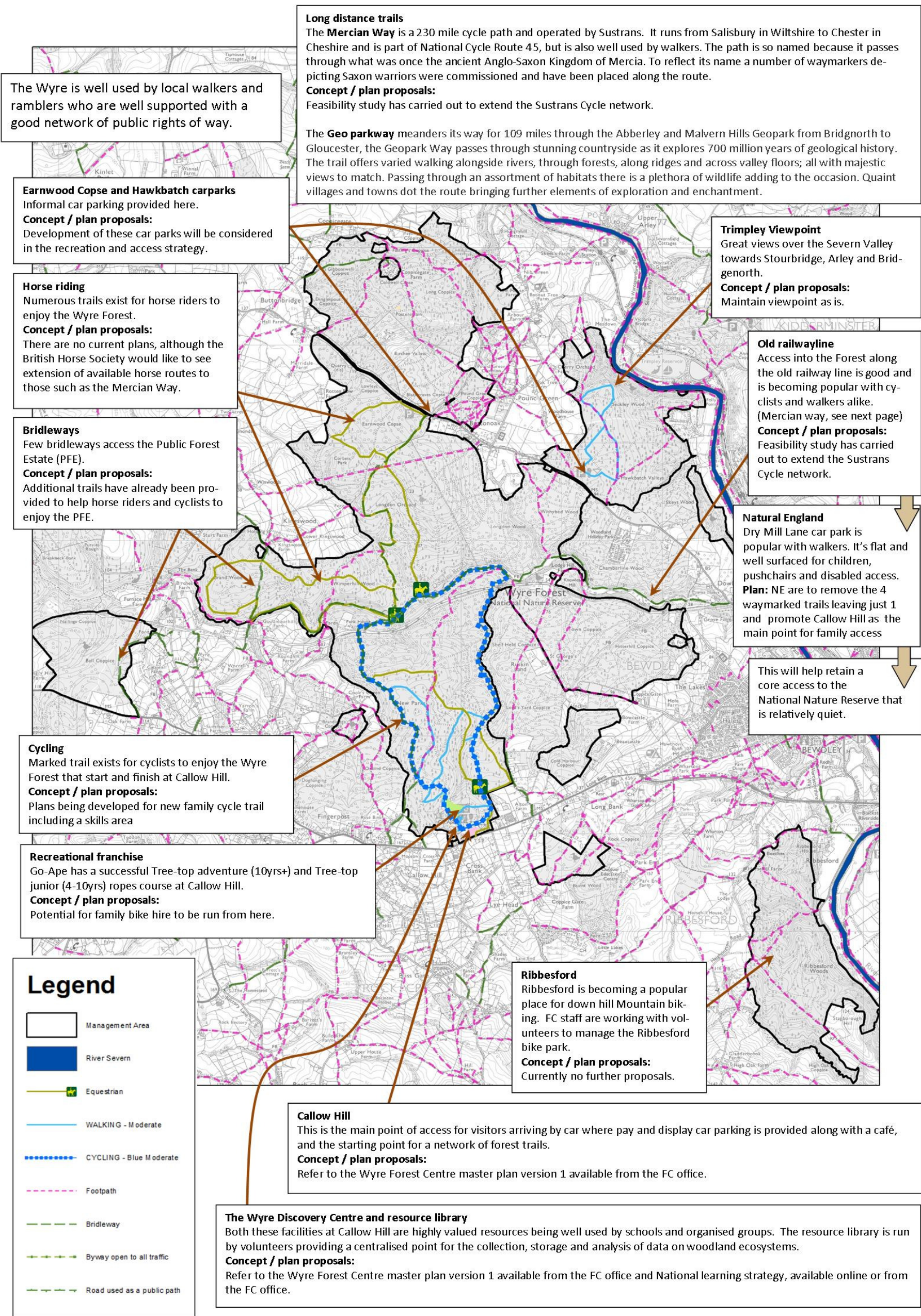
There has been an incremental development of informal wild trails used by mountain bikers. The wild trail network will be managed to reduce risk to visitors and impact on the forest landscape. In general structures constructed from materials brought into the forest or through the significant movement of natural materials (fallen trees or stone) will be removed. The exception to this will be in Ribbesford Wood where the trails are managed in conjunction with local volunteers.

### Managing impacts on wildlife

The potential impacts of increasing visitor numbers on the wildlife of the forest will be considered when planning the development of the access network. All new trails will be located away from known adder hibernacula or important raptor nesting sites. The siting of infrastructure and any necessary additional signage will seek to reduce these impacts based on an approach of informal zoning to maintain areas of relative tranquility. Ongoing monitoring of both wildlife and visitor numbers and activities will provide an improved evidence base on which to evaluate these impacts.



# 4.12 Visiting the Forest: Management Prescriptions





## 4.13 Volunteering and Community: Management Prescriptions

### Volunteering

The existing volunteer opportunities will be extended to provide a coordinated programme of weekly mid-week and monthly weekend practical volunteer tasks. These practical tasks will assist with forestry and habitat management including tree planting, invasive species control, management of open habitats, orchard management and management of grazed areas.

In addition volunteer opportunities will be created to support the ‘front of house’ activity in the forest, welcoming and managing visitors, primarily at Callow Hill and at events. All of these volunteers will assist with maintaining the access infrastructure, carrying out maintenance checks and assisting maintaining gates and stiles, carrying out surface repairs on trails and cutting back vegetation on paths.

The existing groups of survey and monitoring volunteers, most notably the Wyre Forest Study Group and the Butterfly Conservation survey volunteers will be supported and encouraged to develop further. Other groups of survey volunteers will be developed to support the monitoring of a wider range of habitats and species.

### Activities

The existing programme of themed seasonal activity trails at Callow Hill will be continued. The potential redevelopment of Callow Hill may offer opportunities to further extend this programme to include more seasonal or permanent self-guided trails.

The Go-Ape course will continue to be supported and promoted as a key visitor attraction to the forest. In addition the wide range of regular and occasional third party activities including the Park Run, Step-Out outdoor learning, Harlequins orienteering club event will be supported and extended.

### Events

A vibrant programme of events and activities will be supported and enabled. The direct delivery of events is likely to be limited to one or two events a year in the forest aimed at introducing new visitors to the forest and building understanding of the value of the forest and how it is managed. This is likely to include an annual forest fayre focused on developing local markets for wood and food products derived from the forest.

Supporting the Far Forest Show with an increased and improved presence from the forest will form a key element of the annual events programme.

These events will be coordinated with those of partner organisations with the aim of providing a broad, year round programme of events around the Wyre Forest area. To further support this a clear ‘offer’ of speakers and guides will be defined, including costs where appropriate, making it easier for event organisers to involve staff from the forest in events being organised in the local area.

The event space at Hawkbatch will be extended and developed to provide a venue with secure entry for chargeable events. This venue will continue to host outdoor cinema events and will be promoted as a venue for other similar events.



## 4.14 Education & Interpretation: Management Prescriptions

### Education

The Education Team will continue to develop the range of formal and informal educational visits to the forest and further increase the number of 'learners' visiting the forest each year. Educational activities are now provided by an external education provider to operate from the Discovery Centre.

The Education Team will work with partner organisations to develop a wider range of materials and resources to support self-led educational visits to the forest.

A pilot scheme will be developed to train teachers to confidently run their own self-led activities in a forest and to promote the opportunities the forest provides to deliver 'learning outside the classroom', including forest school and play-based approaches to learning.

### Interpretation

The provision of interpretation at the main visitor hub at Callow Hill will be enhanced with a wider range of displays to inform and inspire visitors.

The development of interpretation panels will be considered for select sites, possibly including Simon's Orchard, the Great Bog and Lodge Hill orchard and meadows.

The commissioning of further interpretative sculpture will also be considered to mark key destination points on the access network and to tell the story of the forest and its wildlife in a way that is sympathetic to the forest landscape.

The Butterfly Trail will be maintained and further developed with the re-design of the orientation panel in the Dry Mill Lane car park, the installation of a carved waymarker post at the start of the trail and the upgrading of the interpretation panels.

Further interpretation will be considered along the main way-marked trails from Callow Hill alongside the re-development of the access network in this part of the forest.

The use of digital interpretation will be explored, including the use of QR codes and mobile Apps. This could include the promotion of existing Apps as well as the development of bespoke materials for the forest.

## 4.15 Survey, Monitoring and Research: Management Prescriptions

### Monitoring Programmes: Woodland and Habitats

Monitor the woodland stands for signs of disease and respond promptly to evidence of disease, following the best available advice on disease control.

Carry out an annual census of fallow deer populations will be carried out in March as part of the wider Wyre Forest Deer Management Society census. The census data may be supported by further monitoring of the deer population through thermal imaging surveys.

Carry out deer impact assessment surveys to monitor the impact of deer on the ground flora, shrub layer and tree regeneration in the Wyre Forest.

Carry out a study on a sample of the trees in the forest to determine the degree of genetic diversity in the oak and if possible provide an indication of the origins of the trees.

Carry out Integrated Site Assessment (ISA) surveys of all SSSI Units a minimum of every 6 years.

Maintain the long term monitoring programme of vegetation composition and structure building on the surveys carried out as part of Natural England's Long Term Monitoring Network.

Maintain the long term monitoring of the forest soils, their structure, nutrient and chemical characteristics and mesofauna building on the survey work carried out as part of Natural England's Long Term Monitoring Network.

Establish a remote sensing survey programme of the forest to provide statistical data on the structure of the habitat mosaic and to monitor the change in the structure of the forest tree canopy.

Monitor the correlations between the productivity of woodland stands, the different forestry and management approaches used the impacts of woodland management on key indicator species.

Ensure that monitoring programmes include suitable control plots in minimum intervention areas of a range of aspects and soils types.

Continue to monitor the deer population (esp. fallow and muntjac) and its impacts on the forest through the annual deer census and the monitoring of the impacts of deer browsing on the vegetation of the forest.

Develop a monitoring programme for grey squirrel numbers to provide information on the response of the grey squirrel population to woodland management. Monitor the impacts of grey squirrels of the regeneration of broadleaved trees across the forest.

Monitor the distribution of tree diseases across the forest including Acute Oak Decline, Dothistroma Needle Blight in Corsican pine, Phytophthora ramorum in larch and Chalara fraxinea in ash.

Monitor the distribution of non-native invasive plant species across the forest, including rhododendron, Himalayan balsam and Japanese knotweed.

Monitor the water quality and diffuse pollution levels in the Dowles Brook and its tributaries.

### Monitoring Programmes : Species

Maintain and develop the long standing annual butterfly monitoring programme through both established transects which provide continuity of data and other survey methods which measure the more immediate data on the impacts of woodland and habitat management.

Maintain and develop the newly established woodland bird survey through the annual point count survey and a number of tailored single species surveys.

Maintain and develop the annual reptile survey programmes in the forest, ensuring broad coverage based on repeatable methodologies to provide reliable information on reptile population change and on patterns of dispersal across the forest.

Develop mammal survey methodologies, particularly for bats and dormice, which can be carried out consistently at intervals to provide information on the health of these key indicator species.

Carry out monitoring of any Section 41 species not covered by wider monitoring programmes, specifically maintaining the annual narrow-leaved helleborine survey to enable reporting on population trend as part

of the requirement of the National Nature Reserve under Biodiversity 2020.

Ensure that species monitoring programmes include correlation with national trends to provide a clearer picture of the impacts of management on species populations.

### Monitoring Programmes : Visitors

Monitor visitor numbers at main access points to the forest.

### Research and Survey: Habitats and Species

Develop a research project to study the effect of canopy gap size on different species. The practice of continuous cover forestry on a large scale, using different approaches and with minimum intervention areas which provide a control offers an opportunity to carry out significant research on the effect of varying sizes of gaps in the tree canopy on a range of species.

Develop a research project to study the relationship between different types of young growth woodland and a range of species of associated wildlife. Woodland edge habitats on rides, coppice management and glades created through continuous cover forestry provide an opportunity to study the response of a range of species to young growth woodland with varying characteristics of tree species, deer impact and shade conditions.

Develop a research project to study the rates and patterns of dispersal of a range of indicator species and to assess the role of rides, open habitats and stand structure in improving connectivity/permeability of the forest to species including pearl-bordered fritillary and adder.

Develop a research project to study the impact of grey squirrels on the breeding success of woodland birds.

Develop a research project to study species responses to wood pasture systems and specifically to different levels of tree canopy cover in grazed and managed open habitats.

Carry out surveys to assess the impacts of introducing cattle grazing into the wood pasture areas of the forest, assessing changes in vegetation composition and structure.

Carry out research to assess the composition of the invertebrate assemblage of the high forest canopy using a robust and repeatable method to allow future survey to monitor the effects of management of the broadleaved canopy and the reversion of areas of conifer canopy to broadleaves.

Develop a research project to study the potential impacts of the arrival of wild boar in the forest, including the ecological impact on habitats and other wildlife and the perceptions of visitors to the presence of wild boar.

Commission research to provide a better understanding of understanding of the aquatic habitats of the Dowles catchment. The key characteristics of the brooks (water temperature, shading, etc.) and factors affecting water quality (run-off rates of sediment and pollutants) need to be assessed, along with further survey of the invertebrate interest and recommendations produced for the management of aquatic and riparian habitats.

Commission research to better understand the function of the engineered infrastructure in the Dowles catchment, both in providing a barrier to the spread of disease in crayfish populations and in restricting the migration of other aquatic species in the catchment.

Support ongoing survey and research on the white-clawed crayfish populations in the tributaries of the Dowles Brook.

Carry out research to better understand the distribution, composition and extent of wet flush habitats in the forest and the habitat requirements of the invertebrate assemblage that these wet flushes support.

### Research and Survey: Visitors

Assess the impacts of visitors, their use and behaviour on the wildlife of the forest. Marked variations in the spatial distribution of visitor numbers / activities undertaken are likely to have particular impacts on the wildlife of the forest. Understanding these impacts will enable more effective management of visitors to minimise impacts of the wildlife of the forest.