

Thames Side Habitat Management Handbook



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The purpose of this document is to provide guidance to landowners along the Thames corridor. It gives general descriptions and management practices for habitat types and features that occur with regularity on land immediately adjacent to the Thames. The document is necessarily simplified and will not cover all habitat eventualities. If the specifics of your land are not covered in this document, please contact a qualified advisor or ecologist for information on obtaining further guidance. Many of the habitat communities adjacent to water courses will be very variable in nature, often representing complex mosaics depending on local conditions, regularity of flooding etc, so this document presents the data in a broad-brush way, providing some fundamental information for maximising biodiversity in each habitat. Much of the information is adapted from existing DEFRA guidance and thus should allow an insight into how to improve land to make it eligible for higher tier agri-environment schemes in future and to qualify as priority habitat, should this be something the landowner is keen to consider. Such habitat developments may take many years, but the information contained in this document will help to clarify when the threshold is close to being reached.

Legal Limitations

All activities within this document are required to be undertaken within the legal framework dictated by all schedules of the Wildlife and Countryside Act 1981. Where protected species are present or likely to be present, all on site management must follow best practice and legal guidelines. These include but are not limited to:

- Bird nesting sites
- Bat roosting sites
- Badgers
- Great Crested Newt

For full content of the Wildlife and Countryside Act 1981, please visit:

<https://www.legislation.gov.uk/ukpga/1981/69/contents>

Monitoring

We would always recommend that work to improve biodiversity of a site is complimented by ongoing monitoring. This allows you to better understand the impact of any interventions taken. BBOWT understands that undertaking surveys on a regular basis can be costly but it is recommended that landowners engage with local volunteer wildlife groups who may be able to help. Basic survey methodology for groups such as birds and butterflies can be found from national recording bodies like the British Trust for Ornithology and Butterfly Conservation and can be carried out by anyone. Data on species you receive from any expert surveyors should be shared with the local environmental records centre to increase knowledge of species and habitats across your county.

Habitat Types

The following sections of the document look at each overarching habitat classification in turn, breaking each into more specific examples that are commonly found along the Thames. Each habitat feature is described using the format laid out below.

Feature Descriptions

This field contains a description of the composition and biodiversity value of the habitat. Compare the description to your land parcel to determine whether the subsequent guidance is applicable.

Objectives

The objectives section details metrics for assessing the quality of the land in question against a favourable condition. As such, the lists given here represent the ideal condition of the site, providing a list of conditions to work towards, rather than the condition which is likely to exist on land that has not previously been managed with biodiversity in mind.

Management Statements

This section provides information on appropriate management techniques which will be beneficial in working towards the ideal condition of the habitat as laid out in the objectives section. As a generic guide, management advice is provided here with no knowledge of the land it is applied to. If you feel the guidance does not apply to your land or conditions are unusual, seek further guidance.

Grasslands

Introduction

As much of the ground alongside the Thames has historically been used for farming, notably grazed pasture, grassland is an abundant habitat type adjacent to the river. The level of flooding varies significantly parcel by parcel, so the resultant vegetation will be significantly different as a result. Past management regimes will also make a significant difference to the way the grassland currently looks.

Feature Description



Thames side grassland will, by their nature, be very variable in terms of species. This will depend on geology, frequency of flooding from the river, past and current management etc. Floodplain meadows are recognised by being grass dominated, but also containing frequent broadleaved flowers, often creating a carpet of yellow meadow buttercups in spring and summer, interspersed with the flowers of other species.

From a biodiversity perspective, floodplain meadow will be at its best when grazed by cattle, regularly hay cut or a combination of the two (cutting and aftergrazing). Hay cuts provide a significant benefit in terms of nutrient removal, so should be considered if logistically possible. Additional details on hay cuts and grazing are given in the Floodplain Meadow Handbook referenced in the external resources section. It is recommended that additional familiarity with the benefits of each management technique be gained via the handbook to best inform an appropriate management regime for the site.

Note, much grassland will have been improved over the years. This term refers to improvement in productivity, often with artificial fertilisers and other modern farming methods. Improved grassland is generally poorer for species diversity. As such, most Thames side land is expected to be in either improved or semi-improved condition. The species indicator tables below provide examples of typical species to be found in lowland meadow and semi-improved grassland, which can be used to determine the current status of the land (If the objectives criteria cannot be applied to species in the lowland meadow or semi-improved grassland list, the grassland is considered to be improved). Restoration from improved grassland to species rich grassland is a long and sometimes difficult process which may require overseeding and will very likely take a number of years with consistent management. If you would like more specific advice on management of your particular land, please contact the Wildlife Trust.

Origins of Objectives

Metrics and tables taken from Natural England Baseline Evaluation of Higher Tier Agreements (BEHTA) handbook. Additional cutting and grazing actions taken from [‘Floodplain Meadows - Beauty and Utility. A Technical Handbook’](#) from the Floodplain Meadows Partnership.

Objectives

- Cover of undesirable species (creeping thistle, spear thistle, curled dock, broad-leaved dock, common ragwort, common nettle, marsh ragwort, cow parsley and bracken) no more than 5%
- Cover of wildflowers and sedges throughout the sward 30% or more (excluding the undesirable species listed above and creeping buttercup and white clover)
- Cover of bare ground (including localised areas, for example, rabbit warrens) between 1% and 10%
- Cover of trees and shrubs up to 5%, and indicators of water logging (such as large sedges, rushes, reeds) no more than 20%
- At least two indicator species are frequent and two occasional (see Figure 1 and Figure 2)

Top Level Management Statements

- Management of nutrients in regularly flooded grasslands is critical. Hay cuts and grazing are both valid methods of achieving this, with cutting providing greatest benefit for nutrient removal and grazing the greatest for habitat structure.
- Timing of operations will be dependent on the weather and water levels. Some variation year on year is expected, as is some variation in the plant communities as a result of such changes.
- Reinstatement of high-quality grassland, can be a very long process. Species enhancement measures may be feasible in some areas to speed up this process.

Management Recommendation

Month(s) to Undertake

Note: It must be ensured that correct permissions are in place prior to following any prescriptions laid out below. Some activities may require additional permissions or licenses to be compliant with existing land management schemes or the law.

Cut and remove vegetation on an annual basis. Remove cuttings from the compartment as far as practical. Where this is not achievable, form a grass pile/ piles at a suitable location, bearing in mind these will be most beneficial in partial sun and being aware of floodplain restrictions.

Earlier cuts are beneficial in floodplain situations, as they ensure the removal of more nutrient from the soil, counteracting deposition of nutrients by river sediments during flood events. Cut fields should be left with an area (20%) uncut to provide winter structure and shelter (many species of invertebrate, including some micro-moths, overwinter in dead plant stems). This area should be moved year on year to ensure nutrient removal from entire compartment. If the sward is significantly grass dominant, there may be little benefit to this, so cutting the entire compartment may remain the best option.

Late July-September (earlier cuts are better for nutrient reduction, so are often used in floodplain meadows, but regular early cutting is likely to be detrimental to seed set in later flowering species).

‘Aftermath grazing’, where livestock are brought onto ground following a hay cut to keep vegetation down and continue to manage the structure. Where possible, cattle provide the best solution for this, creating the most dynamic grassland structure and doing more to diversify encroaching scrub, though they often need to be taken off the land earlier in the year due to their weight increasing the likelihood of poaching. Sheep may also be used for aftermath grazing, though the tolerance of the breed to wet ground should be considered.

Hay cut time until point at which ground becomes wet enough to initiate poaching

Where hay cuts are unfeasible, or geography makes flooding less frequent, late summer to autumn grazing is recommended for diversifying the grassland structure. Earlier season grazing is possible but will impact more significantly on ground nesting birds and plant species with an annual lifecycle which may be prevented from setting seed and may not persist.	August – point at which ground becomes wet enough to initiate poaching
Control of undesirable species with the potential to become dominant. Where possible, hand pulling species by the root is the best option, leaving the plants under or shrubs where they cannot freely seed. Species are considered undesirable if they are becoming too dominant in the sward or pose a safety risk (it is the landowner's responsibility to judge an acceptable level of presence). These may include: • Creeping thistle • Spear thistle • Larger dock species • Hemlock • Ragwort (may become quite dominant, but is an excellent invertebrate foodplant, with c.30 solely dependent species in Britain, so should never be eliminated. If no livestock use the site, a reasonable level of this species should be accepted as beneficial, within the 5% cover metric given above).	May-September, depending on flowering of species. It must be ensured that those pulling the plants are aware of any risks and competent in identification of the target species.
Additional Enhancement Actions	Month(s) to Undertake
Soil sampling will be beneficial to understand the feasibility of grassland reversion to lowland meadow priority habitat. The tables in Figure 3 and Figure 4, taken from the Natural England BEHTA handbook, help gauge suitability based on Nitrogen, Phosphorus and Potassium values in the soil.	Any time of year.
Overseeding using an appropriate method and seed mix if soil conditions allow.	Method dependent. Consult BBOWT for further advice.

Semi-improved grassland

Soils and topography	Wildflower indicator species	Species abundance threshold	Typical grasses (do not count as indicator species)
Found on a wide range of soil conditions, often derived from above habitats by a degree of agricultural improvement. Moderately species-rich, with typically 8–15 species/m². Total cover of wildflowers and sedges usually less than 30%, excluding white clover, creeping buttercup and injurious weeds. Ryegrass cover generally less than 25%.	autumn hawkbit black medick burnet saxifrage bulbous buttercup common cat's-ear common fleabane common sorrel creeping cinquefoil crossword cuckooflower field wood-rush germander speedwell hedge bedstraw lesser trefoil ribwort plantain meadow buttercup red clover selfheal smooth hawksbeard tufted vetch wild carrot yarrow	At least five occasional in the sward. A limited number of indicator species from grassland priority habitats may be present, and may be only rare or localised in the sward. Can substitute for a semi-improved indicator if at least occasional.	cock's-foot common bent crested dog's-tail creeping bent false oat-grass meadow fescue meadow foxtail red fescue sweet vernal grass Timothy tufted hair-grass Yorkshire-fog

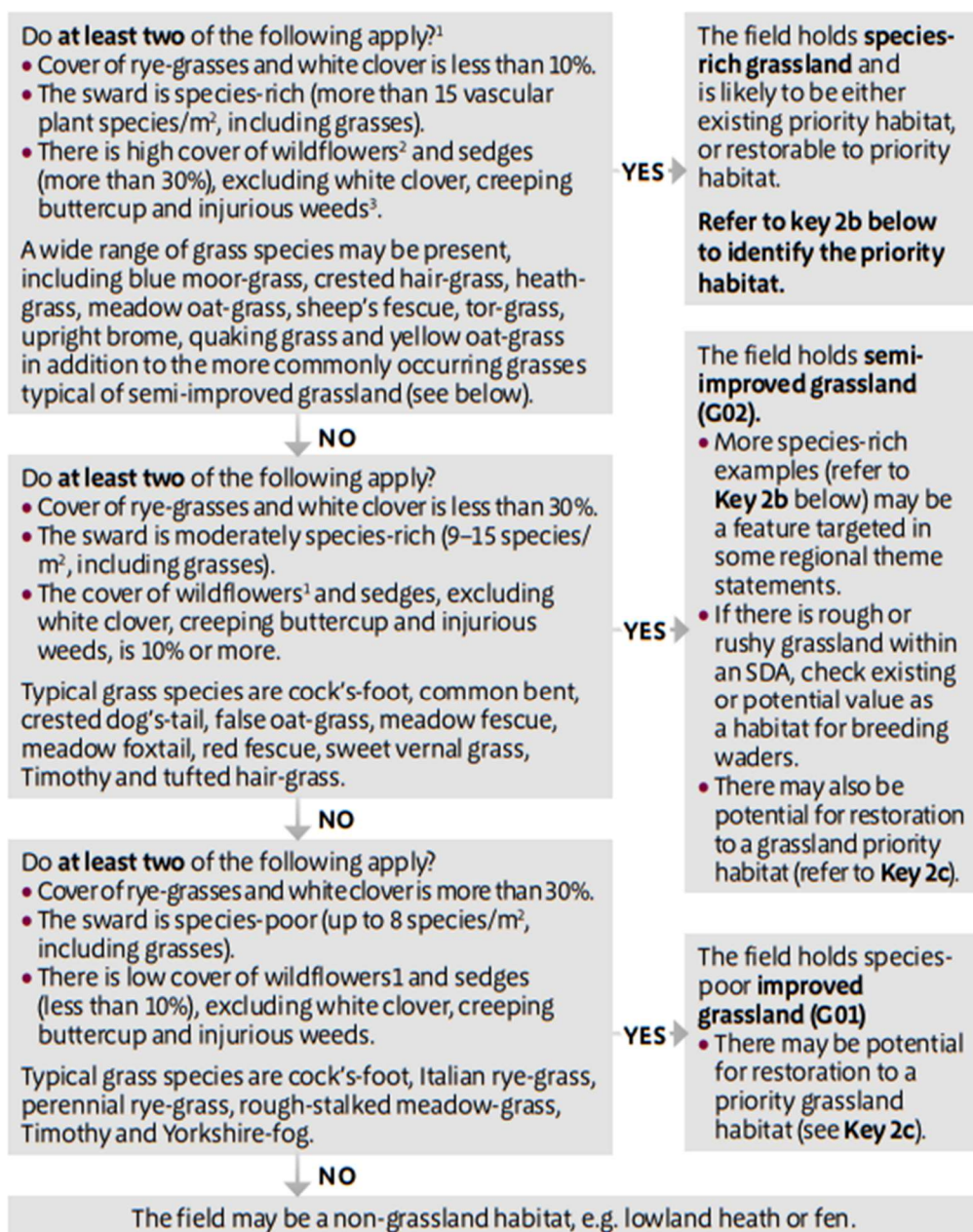
Figure 1 - Indicator species of semi-improved grassland (taken from BEHTA manual)

Lowland meadows – priority habitat

Soils and topography	Wildflower indicator species	Species abundance threshold	Typical grasses (do not count as indicator species)
Free-draining, neutral soils in the lowlands and upland fringes, including species-rich flood plain grasslands. (If there is high rush cover, go to Table 5.)	agrimony autumn hawkbit betony bird's-foot-trefoil bitter-vetch black knapweed bugle burnet saxifrage common bistort common meadow-rue corky-fruited water-dropwort cowslip devil's-bit scabious dropwort Dyer's greenweed eyebright field scabious goat's-beard great burnet greater bird's-foot-trefoil lady's bedstraw lady's-mantles marsh/fen bedstraw marsh marigold marsh speedwell marsh valerian meadow vetchling meadowsweet milkworts narrow-leaved water-dropwort orchids ox-eye daisy pepper-saxifrage pignut ragged robin rough hawkbit salad burnet saw-wort sneezewort tormentil water avens water mint wood anemone yellow rattle small blue-green sedges (glaucous, common, carnation)	At least two frequent and two occasional in the sward, or, for flood plain meadows, one frequent bold species and three occasional. If three indicator species are occasional or four are present at lower frequencies (but not limited to field corners or edges), then record as G06 in condition B. Record as failing condition 5 in the notes column.	cock's-foot common bent crested dog's-tail meadow fescue red fescue sweet vernal grass yellow oat-grass Yorkshire-fog

Figure 2 - Indicator species of lowland meadow (taken from BEHTA manual)

Key to identify semi-improved (Go2) and species-rich grasslands



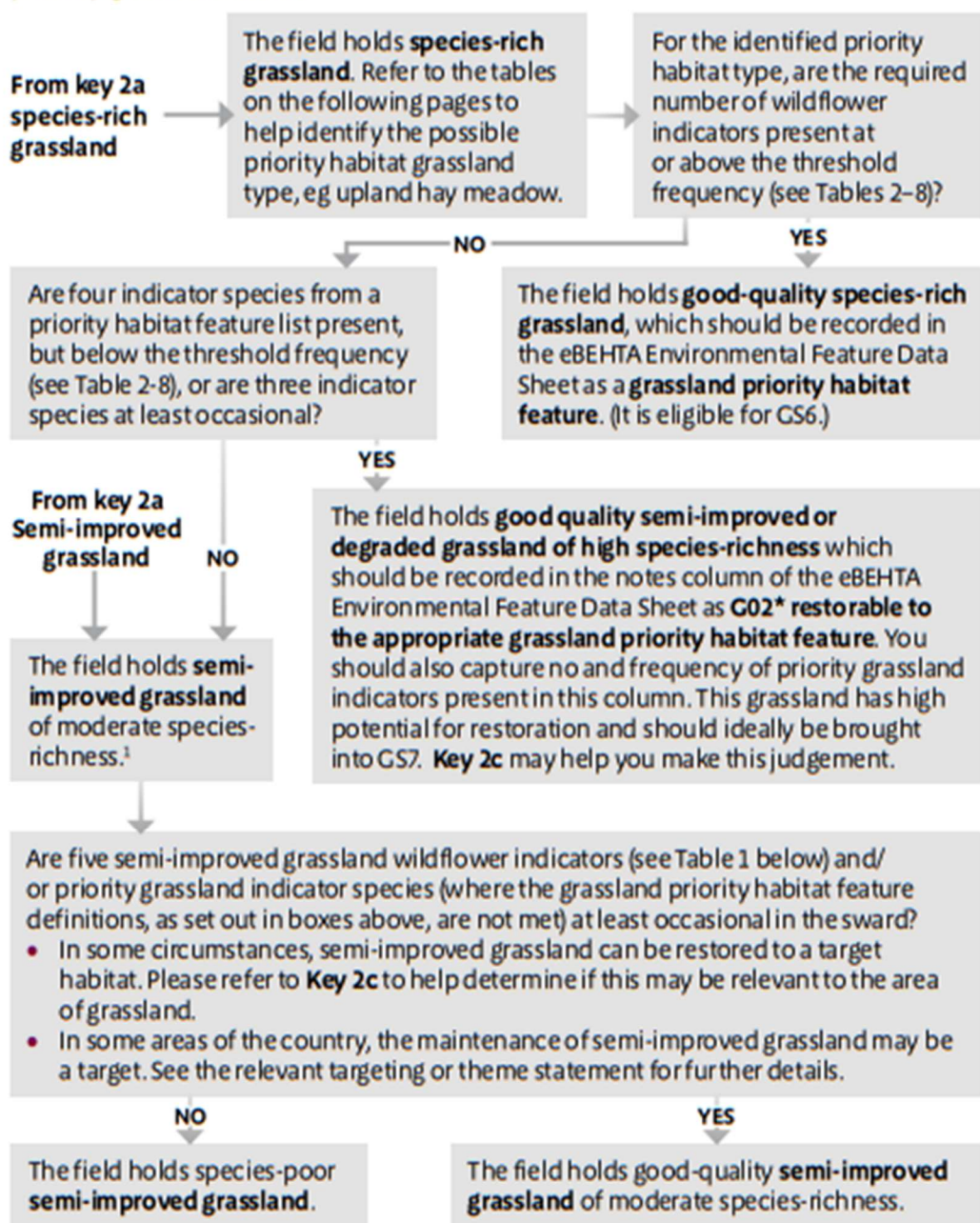
¹ Whilst these criteria generally hold true for most species-rich grassland, some lowland acid grasslands may be naturally species-poor and/or be dominated by grasses and lower plants. Some purple moor-grass and rush pasture swards may not meet these criteria especially where grazing is intermittent or has been abandoned. If on soils where these habitats might occur, check whether indicator species are present and frequency thresholds for features G05 or G07 are met.

² The term 'wildflowers' is used here to mean broadleaved herbs, sedges and rushes. Plants may not all be in flower at the time of the survey.

³ Injurious weeds are creeping and spear thistles, broad-leaved and curled dock and common ragwort.

Figure 3 - Key to identification of semi-improved and species rich grasslands (taken from BEHTA Manual)

Key 2b Key to identify grassland priority habitat and grassland restorable to priority grassland status

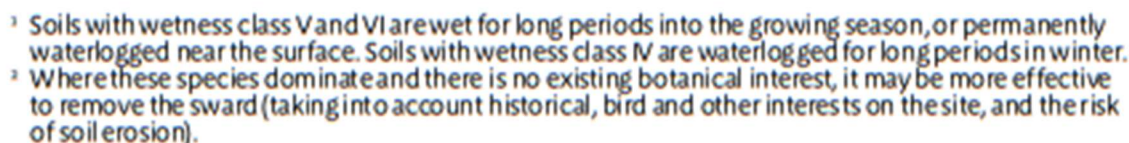


¹ In wet grassland with a bulky sward, which includes a number of wildflowers and occasional to frequent rushes and sedges, and where cover of rye-grasses and white clover cover is less than 10%, check for the number and frequency of indicator species of purple moor-grass and rush pasture and lowland meadow and pasture and record as such if the criterion is met. Similarly, in short swards on sandy soils check the number and frequency of indicator species of lowland dry acid grassland. In such swards, there may be fewer than 15 species per square metre and less than 30% cover of wildflowers and sedges, so the grassland may be identified as semi-improved in Key 2a.

Figure 4 - Key to identification of priority grassland and grassland restorable to priority habitat status (taken from BEHTA manual)

Does the soil or slope impose high stress on plants by:

- **Drought:** very shallow (<10 cm above rock) or extremely stony soil (>70% stones)
- **Steepness:** very steep slope of >25° (46% or 1 in 2)
- **Water logging:** soil wetness class V or VI1



Wetlands

Introduction

Wetlands are less common than might be expected on the Thames side. This is because the ephemeral nature of the flooding in the area is far more likely to create wet grasslands and woodlands than established fen, which generally forms in the presence of a more settled hydrological regime. Where plant communities develop beyond wet grassland, this tends to manifest in the form of sedge and reed sweet grass dominated swamp. As such, these communities form the basis of the following advice. If you suspect your land has a fen community that differs from this description, please contact the Wildlife Trust for more specific advice.

This section also considers guidance for open water bodies, defined here as wet ditches and ponds. It is recognised that these features take a significant variety of forms, so the guidance given relates to general principles. If you are not confident that this advice is applicable to your situation, or if you would like to thoroughly confirm the presence or absence of protected species (notably great crested newt) in water bodies on your land, please contact the Wildlife Trust for advice.

Sedge Bed/Reed Sweet Grass Swamp/Fen

Feature Description



The fens found along the Thames corridor are generally dominated by large sedge species, often with leaves in an 'M' shaped cross section. Typically waist height or more, the vegetation appears as a single block of large plants, though other species will often be found if you check among these.

The management advice within this document considers sedge beds and reed sweet grass swamps as the most prevalent 'fen' type habitat in the Thames corridor. You may need additional advice if your land contains fen habitat that does not fit this description.

Sedge dominant fen is best managed through regular cutting or grazing (note, fen habitat between Wallingford and Goring is known to contain Desmoulin's Whorl Snail, a nationally scarce priority species, so it is good practice to gain a species assessment prior to instigating cutting regimes. Contact the Wildlife Trust if you are concerned about this). The mowing regime should be designed to cut the fen at different intervals, creating litter at a variety of depths and complexities, but ensuring it does not build up significantly over long periods.

Origins of Objectives

Metrics taken from Natural England Baseline Evaluation of Higher Tier Agreements (BEHTA) handbook.

Objectives

- The water level and its management results in water at or near the ground surface, throughout the year
- There is no artificial drainage designed to dry out the fen, for example, internal drains or a surrounding ditch
- Cover of undesirable species (common nettle, docks, creeping/ spear thistles, common ragwort and Himalayan balsam) should be less than 5%
- Cover of scrub should be between 1 and 10%
- Cover of bare ground should be less than 10%
- No more than 25% of the fen area should have a continuous cover of litter (i.e. dead vegetation)

Top Level Management Statements

- Water levels are critical – site should be monitored regularly for signs of changing water behaviour
- Creating a varied litter layer throughout the fen will create a diverse structure, maximising diversity throughout the fen.
- Significant scrub colonisation should be avoided.

Management Recommendation

Month(s) to Undertake

Note: It must be ensured that correct permissions are in place prior to following any prescriptions laid out below. Some activities may require additional permissions or licenses to be compliant with existing land management schemes or the law.

Cutting and removing of fen vegetation in line with cutting plan (see example rotation below). Rotation lengths should be varied, ensuring differing structure and differing species niches in each part of the fen. Cutting must be undertaken outside of bird nesting season and both sides of any ditches should not be cut in any individual season. Fen is best cut using reciprocating or spinning blades (for example, walk behind BCS autoscythes, bladed brushcutters or manual scythes), rather than flail machinery, as this helps to ensure ease of transport and maximum material removal, maximising nutrient reduction and thatch removal. Arisings to be removed as far as practical from fen areas, though some should be retained (within the guidelines of floodplain regulations) to form composting mounds for the benefit of grass snakes and amphibians. It is recommended that any cutting regimes be agreed by an independent ecologist/conservation worker.

September-October (after legal bird nesting season is over but prior to ground becoming too wet).

Scrub clearance within fen area. As per objectives above, scrub cover within the fen area should be no more than 10%. Establishing willow should be dug out by the root where possible, with established trees being managed as low-level pollards

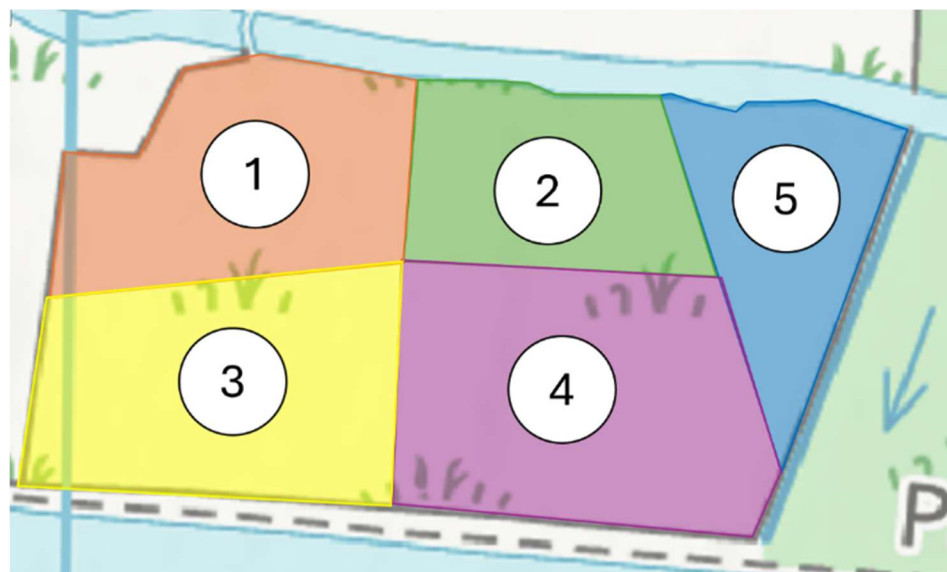
October-February

Pollarding of established trees within fen. Trees should have all branches cut back to the main trunk. Trees to be managed on a three-to-four-year cycle, ensuring trees in different states exist across the site.	October-February
Grazing, where possible, is considered beneficial to the structure of the fen. Light grazing using cattle will usually be enough to diversify the vegetation structure. Such grazing should be kept to a minimum when the ground is waterlogged, as excessive poaching can adversely affect the fen community. Where livestock grazing is unavailable or impractical, a suitable cutting regime may be substituted. If your site has, or is suspected to have, a colony of Desmoulin's whorl snail, contact the Wildlife Trust for further advice.	May-September
Invasive species control. Notably Himalayan balsam. Invasive species should be identified and removed. Herbaceous plants can be pulled out by the root when in flower, woody growth should be removed by the root if possible. Trampling of sedge beds should be minimised during works to avoid disturbance to nesting birds.	June-October (Himalayan balsam. Flowering season for other species).

Habitat Indicator Plant Species

Bogbean	Sedges
Marsh pennywort	Gypsywort
Branched bur-reed	Water forget-me-not
Meadowsweet	Hemp-agrimony
Purple-loosestrife	Water horsetail
Cotton-grass species	Lesser spearwort
Ragged robin	Water mint
Reed canary-grass	Wild angelica
Common skullcap	Marsh/fen bedstraw
Reedmace	Yellow flag
Common reed	Marsh cinquefoil
Reed sweet-grass	Yellow loosestrife
Common/marsh valerian	Marsh-marigold

Table 1 - Indicator Species for Thames side Fen

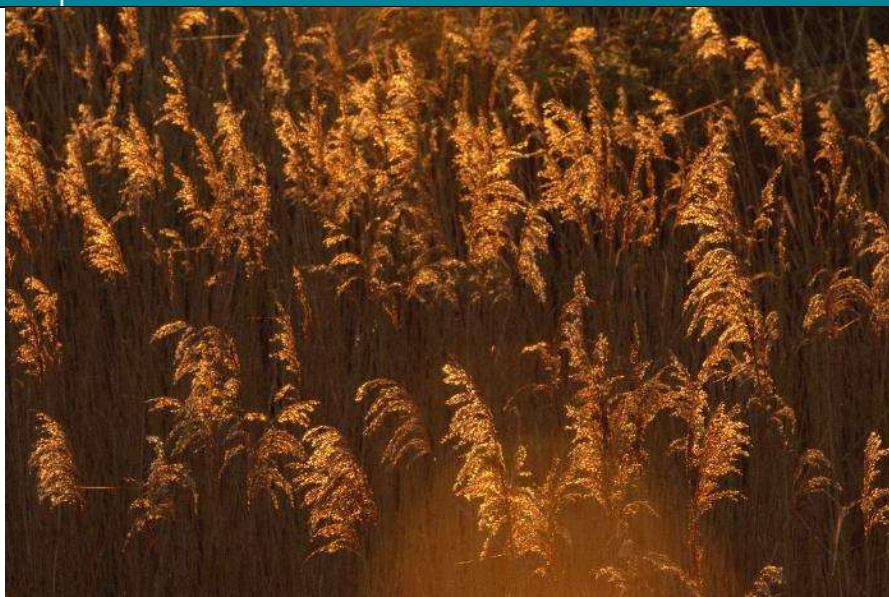


Compartment	Year									
	1	2	3	4	5	6	7	8	9	10
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2		✓		✓		✓		✓		✓
3			✓			✓			✓	
4					✓					✓
5										

Sample Cutting Plan, showing an annual cut (1), different length rotational cuts at 2, 3 and 5 years (2)(3)(4) and a non-intervention compartment. The cut rotation has been designed to also diversify the vegetation structure alongside the drainage ditch and the edge of the uncut block. Ticks represent a cut taking place.

Figure 5 - Sample Fen Cutting Rotation

Feature Description



Thames side reedbeds are generally small, generating in areas that are wetter than grassland or fen, often in lower lying areas or areas directly adjacent to open water. They are often standing in open water throughout the year and are readily recognised by their tall, hollow stems (up to 4m tall) and feathery flowerheads.

The fragmentary nature of reedbeds along the Thames often limits their value to specialists of larger reedbeds such as bittern or bearded tit, but they are still exceptionally valuable habitats for nesting warblers, notably reed warbler, sedge warbler and Cetti's warbler, as well as wading water birds such as snipe and water rail. The stems of the reed, as well as the litter beneath them provide excellent habitat for a substantial number of invertebrate species, especially where their presence at a water margin allows for their vegetative structure to be utilised by aquatic invertebrates.

Effective maintenance of a reedbed involves the prevention of excessive litter build up, which will eventually lead to drying of the reedbed. This is predominantly done through rotational cutting of the reed and removing the cuttings, though these can be left nearby as habitat piles if longer distance extraction is prohibitive. Regular cutting ensures that reed remains dominant, preventing colonisation by less desirable species.

Origins of Objectives

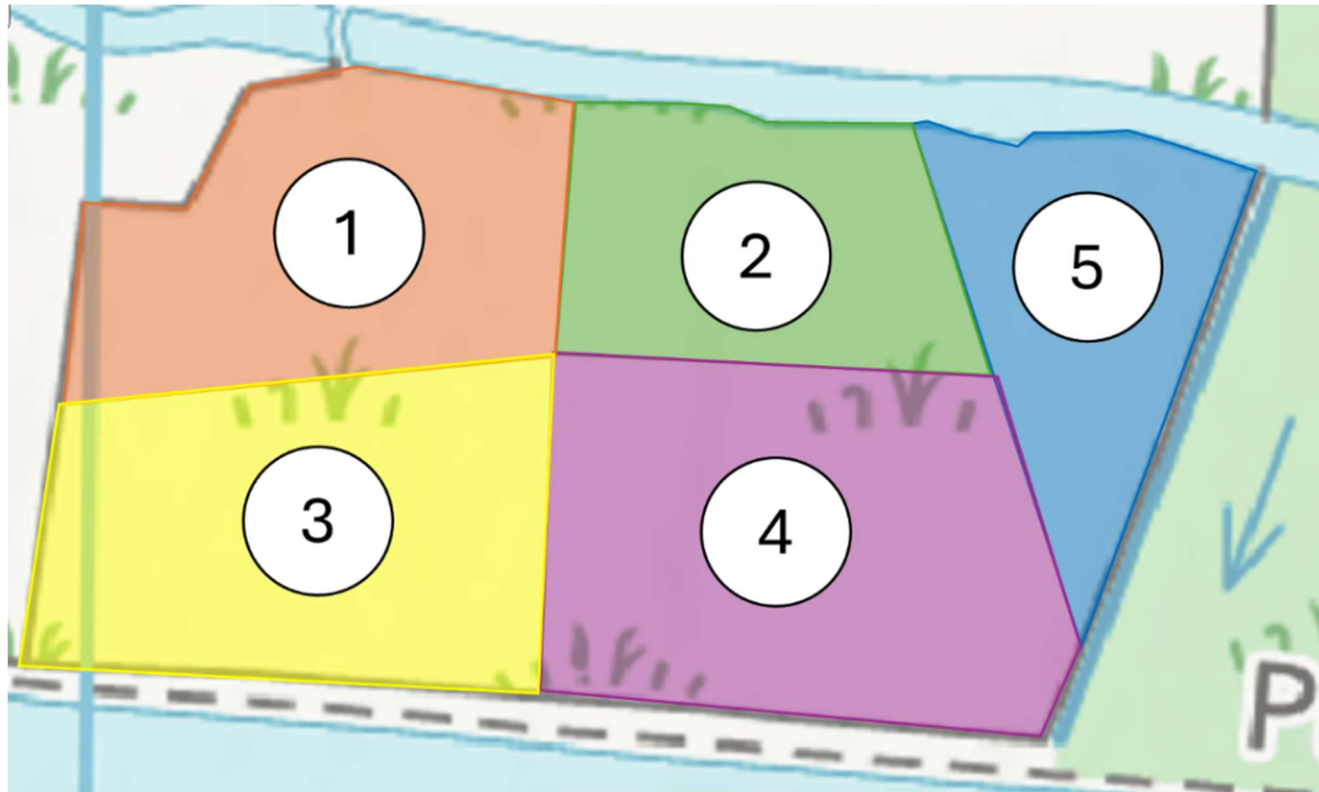
Metrics taken from Natural England Baseline Evaluation of Higher Tier Agreements (BEHTA) handbook.

Objectives

- Cover of scrub within the reedbed is less than 10%.
- The vegetation should include at least 60% reeds.
- Surface water is present over at least part of the reedbed for most of the year.
- Cover of undesirable species (common nettle, docks, creeping/ spear thistles, common ragwort and Himalayan balsam) should be less than 10%.

Top Level Management Statements

• Water levels are critical – site should be monitored regularly for signs of changing water behaviour. • Creating a varied litter layer throughout the reedbed will create a diverse structure, maximising habitat diversity and species opportunities. • Significant scrub colonisation should be avoided.	
Management Recommendation	Month(s) to Undertake
Note: It must be ensured that correct permissions are in place prior to following any prescriptions laid out below. Some activities may require additional permissions or licenses to be compliant with existing land management schemes or the law.	
Cutting and removing of reed in line with cutting plan (see example rotation below). Rotation should be no shorter than 4 years, which allows reed time to reach maximum size while also ensuring areas of young growth. Cutting must be undertaken outside of bird nesting season and both sides of any dividing ditches should not be cut in any individual season. Reed is best cut using reciprocating or spinning blades (for example, walk behind BCS autoscythes, bladed brushcutters or manual scythes), as this helps to ensure ease of transport and maximum material removal, maximising thatch removal. Arisings to be removed as far as practical from reedbed areas, though some should be retained to form composting mounds for the benefit of grass snakes and amphibians within the guidelines of floodplain regulations. It is recommended that any cutting regimes be agreed by an independent ecologist/conservation worker.	September-October (after legal bird nesting season is over but prior to ground becoming too wet).
Scrub clearance within reedbed area. As per objectives above, scrub cover within the fen area should be no more than 10%. Establishing willow should be dug out by the root where possible, with established trees being managed as low-level pollards	October-February
Pollarding of established trees within reedbed. Trees should have all branches cut back to the main trunk. Trees to be managed on a three to four year cycle.	October-February
Invasive species control. Notably Himalayan balsam. Invasive species should be identified and removed. Herbaceous plants can be pulled out by the root when in flower, woody growth should be removed by the root if possible. Trampling of reedbeds should be minimised during works to avoid disturbance to nesting birds.	June-October (Himalayan balsam. Flowering season for other species).



Sample Cutting Plan. The cut rotation has been designed to also diversify the vegetation structure alongside the drainage ditch and to create adjoining margins of different ages across the rotation. Blocks could also be divided by or wet ditches, where this would not cause the reedbed to dry. One numbered block to be cut each year in ascending order.

Figure 6 - Sample Reedbed Cutting Rotation

Feature Description



Ponds can come in any number of forms, sizes, shapes and levels of establishment. For the purposes of this document, ponds are considered to be permanent or temporary pools of any depth with a surface area of no more than 2Ha (at normal winter high water). They can hold water for all or part of the year and be in full sun, full shade or a mixture of both. They can be silted or unsilted.

It is understood that freshwater habitats are some of the most diverse landscape features in Britain, with each different situation suiting a different species set. Generally, shallower pools (<10cm) are the most biodiverse features, though many of the groups that are found in these pools will not be easy to identify without specialist knowledge.

When dealing with ponds, the function and condition of the pond, as well as its current aspect (in the case of established ponds) need to be carefully considered before undertaking any action. Where older ponds are concerned, the established system can be very readily damaged by sudden change, including felling of trees and severe dredging, so it is recommended that advice is sought on a case-by-case basis before undertaking any management interventions.

Origins of Objectives

Metrics taken from Natural England Baseline Evaluation of Higher Tier Agreements (BEHTA) handbook. Additional information has been gathered from Freshwater Habitats Trust's pond creation toolkit, which provides very detailed information on both pond creation and maintenance. It is recommended that any guidance given here is supplemented with information from the FHT toolkit, as pond management is complex and very situational.

Objectives

- The pond should be set within a semi-natural habitat or have a suitable buffer.
- There should be no obvious sign of pollution or of inappropriate quality of the water supply.
- There should be an absence of damaging non-native plant or animal species.
(Damaging plants include water fern, Australian swamp stonecrop, parrot's feather,

floating pennywort and Japanese knotweed (on the bank). Damaging animals include non-native crayfish, non-native reptiles and non-native amphibians.) • The pond should not be stocked with fish or support damaging numbers of wildfowl. • It should experience only natural fluctuations in water level.	
Top Level Management Statements	
• The ideal pond does not exist. Established aspect and species should be considered and understood before undertaking any management changes. • Shallow water and natural silting will create the most sympathetic pond system to the greatest number of species, but this may result in a feature quite different from that originally designed. • It is important to understand how you want your pond to function prior to its creation. This may affect the design and the ideal level of vegetative colonisation, for example. • If shared with livestock, it is not necessary to fence off unlined ponds. Poaching of edge margins creates a habitat in itself. This may be detrimental to the establishment of edge vegetation, so this should be considered if creating a pond for specific groups of animals (e.g. newts or dragonflies, some species of which depend on marginal vegetation to complete their life cycle).	
Management Recommendation	Month(s) to Undertake
Note: It must be ensured that correct permissions are in place prior to following any prescriptions laid out below. Some activities may require additional permissions or licenses to be compliant with existing land management schemes or the law.	
Note: The management guidance given below is primarily for newly created ponds in an open landscape and is focussed on creating habitat diversity in a small area. It does not represent an 'ideal pond'. Established pond aspects and species should be considered, as should the goal of the feature (e.g. is it present to benefit a particular species?) prior to any works being undertaken.	
Prior to any works being undertaken, determine the management priorities for the pond. If the pond is to be maintained as an aesthetic feature, it must be recognised that the wildlife value will be limited. Equally, if biodiversity is considered the priority, it must be understood that the pond may not be aesthetically pleasing.	N/A
Non-native species control. Non-native species should be identified and removed. Herbaceous plants can be pulled out by the root when in flower. Establishment of Himalayan balsam is possible, as well as garden escapes from adjacent properties. Seek advice if the pond is colonised by invasive aquatic species such as New Zealand pygmyweed, parrot's feather and water fern, as these can be very difficult to eradicate once established and can easily spread to other water bodies if effective biosecurity is not carried out.	May-October (Primary season to look for non-natives colonising)
Removal of any fish populations (especially non-native species such as goldfish) via netting or electro fishing in established ponds not connected to river systems. In most cases this will be beneficial to the biodiversity of the pond and is especially critical in ponds containing Great Crested Newt populations.	Gain advice from a specialist contractor.
Identification and creation of retained canopy trees/willow pollards. Number of trees to be judged on a case-by-case basis based on pond size. Pollards should be recut once every 4-5 years in management rotation.	October-February (dormant season for the tree and outside bird nesting season)
Rotational cutting to ground of establishing scrub along pond edge. Cut on 4-5 year rotation to match the pollarding rotation,	October-February (dormant season for

creating different levels of scrub maturity along the pond edge. In this way, completion of the rotation will signal re-pollarding of any previously managed trees.	the tree and outside bird nesting season)
Cut and remove arisings if required from the base of temporary ponds. This should include young willow and other woody growth. If the burden of young trees becomes significant enough to make the cut difficult, the root plates can be dug out using machinery. The latter should only be undertaken if necessary (i.e. if annual management is difficult or 1 year's growth is significant enough to shade out herbaceous plant species sharing the temporary pool). Arisings can be deposited with the cuttings from the grassland features (though you may choose to shred or separate woody cuttings).	September

Pond Management Principles

Note: these principles are illustrative only, they do not represent an optimum pond condition, as historical aspect, management and species will affect necessary management of the water feature. The figures below are intended to detail proportional areas of water of different depths beneficial to wildlife. In areas of shallow water, a fringe of reedmace, common reed and sedge is beneficial but should be promoted as intermingled areas rather than as large, single species blocks.

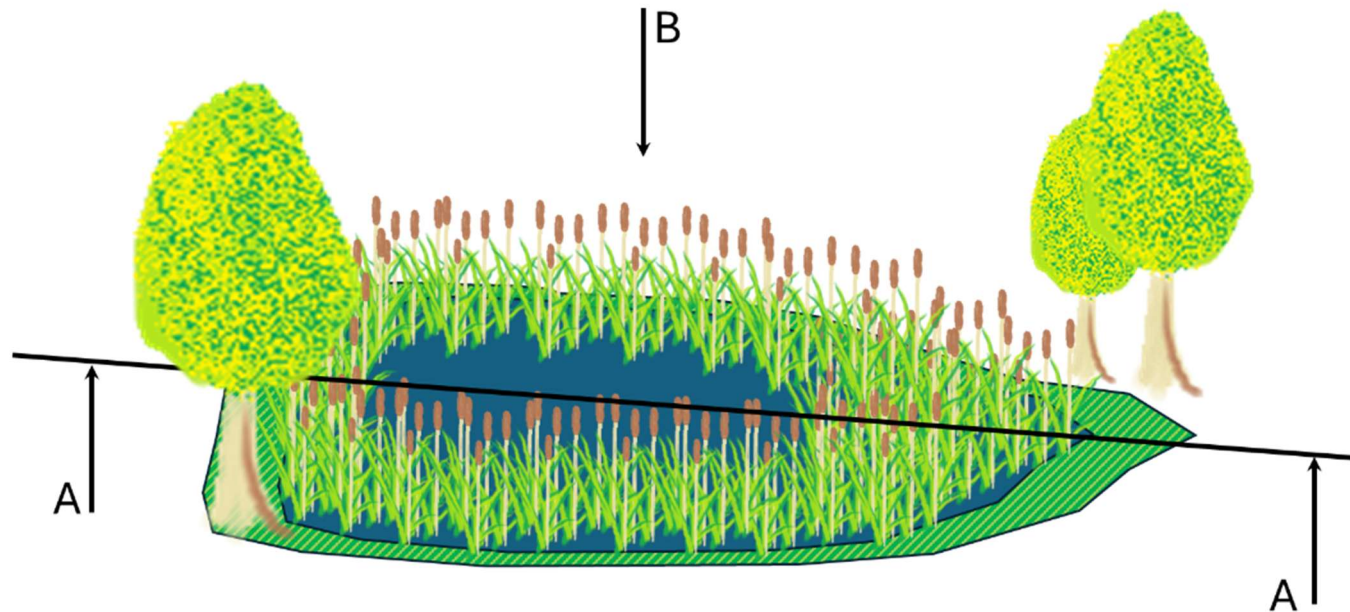


Figure 7 - Overview of Representative Pond

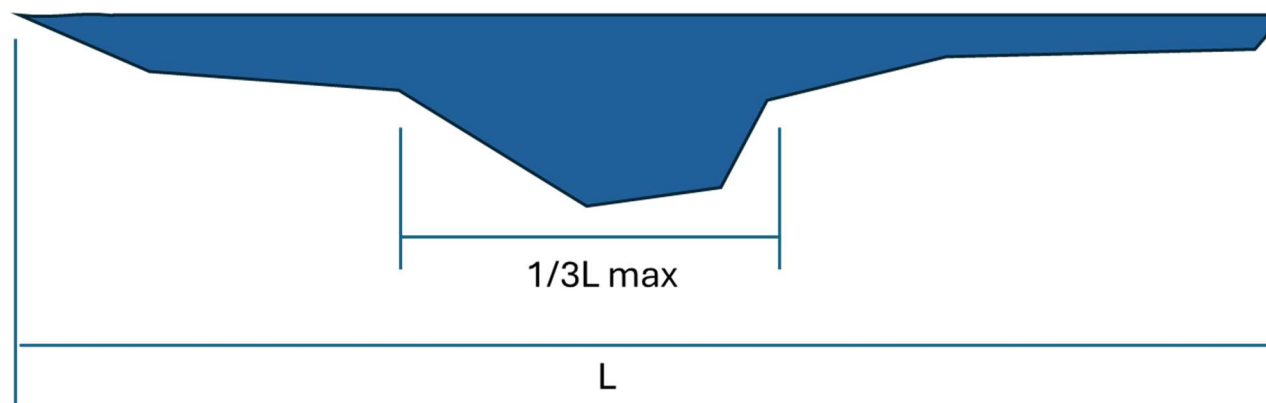


Figure 8 - Section A-A

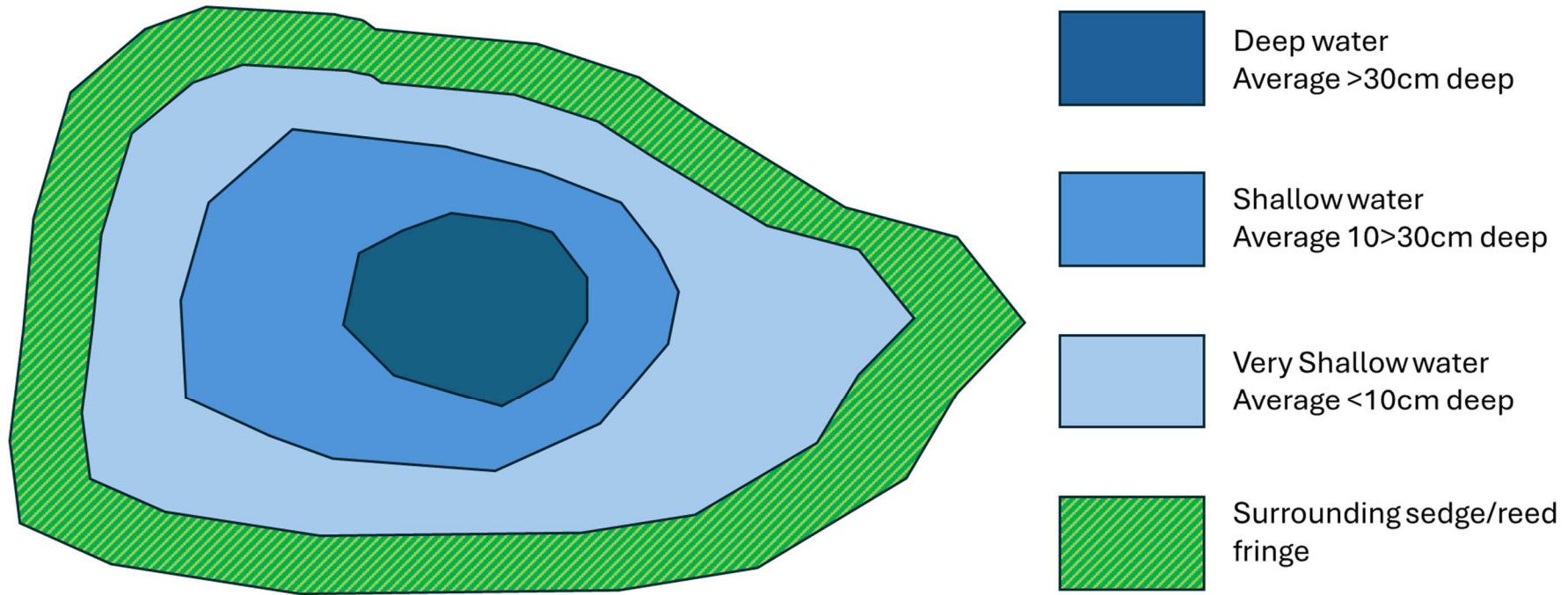


Figure 9 - View on arrow B

Temporary Pool Example Design

The image below demonstrates the principles of a temporary pool developed to maximise biodiversity. Within the flooding area, low herbaceous vegetation grows, including areas of bare ground created by flooding. The fringe of the pool is surrounded by scattered sedges, reedmace and similar species, creating a more structured and complex margin when the pool is flooded. One edge is bounded by young, successional willow, with one tree developing into a large and established pollard. Willow is prevented from establishing significantly in the pond centre by annual cutting or removal by the root.

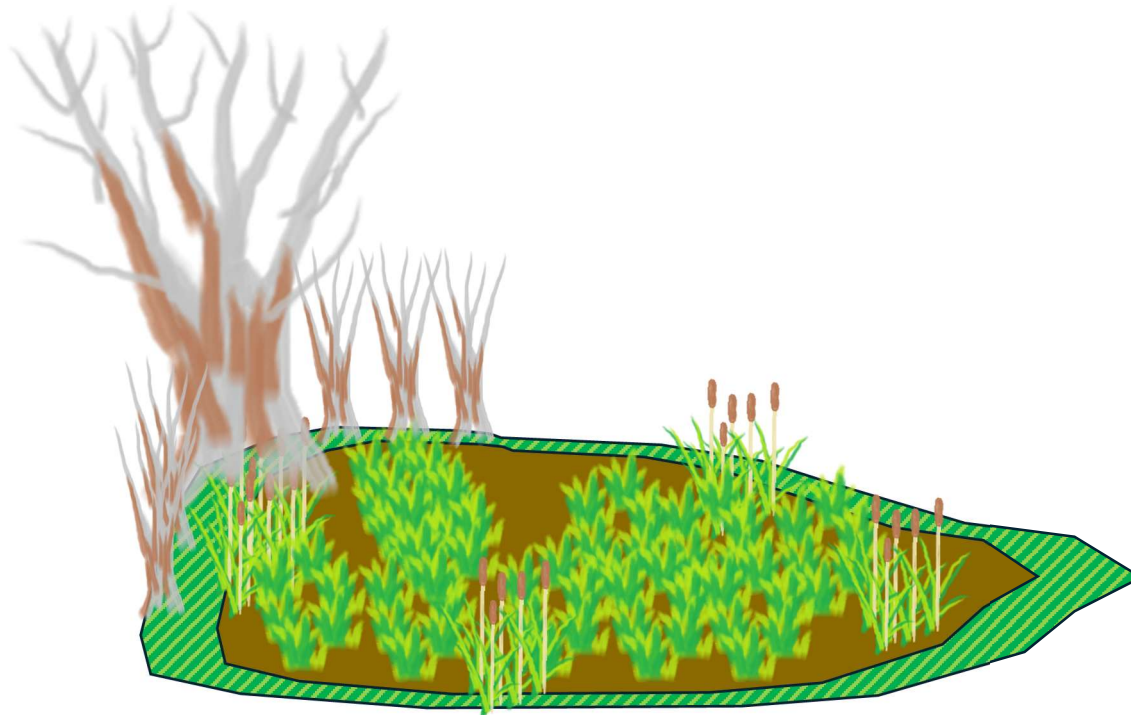


Figure 10 - Representative Condition of Mature Temporary Pool

Feature Description



Ditches are features narrower than 5m wide and more than 20 times longer than their width. They provide useful connection across landscapes while generating differing habitats based on geographical aspect and prevalence of sun. In some cases, agricultural drainage ditches may be considered as habitat ditches, but the 'objectives' section below should be used to determine how well the ditch fits this definition and whether restoration to a biodiverse state is feasible and desirable.

Origins of Objectives

The DEFRA Countryside Stewardship BEHTA manual is used to define a wet ditch which is of sufficient quality to enter into a higher tier agri-environment agreement. In this case, this is deemed equivalent to a ditch in good condition for wildlife. Additional information has been drawn from 'Habitat Management for Invertebrates' (Kirby, 2013).

Objectives

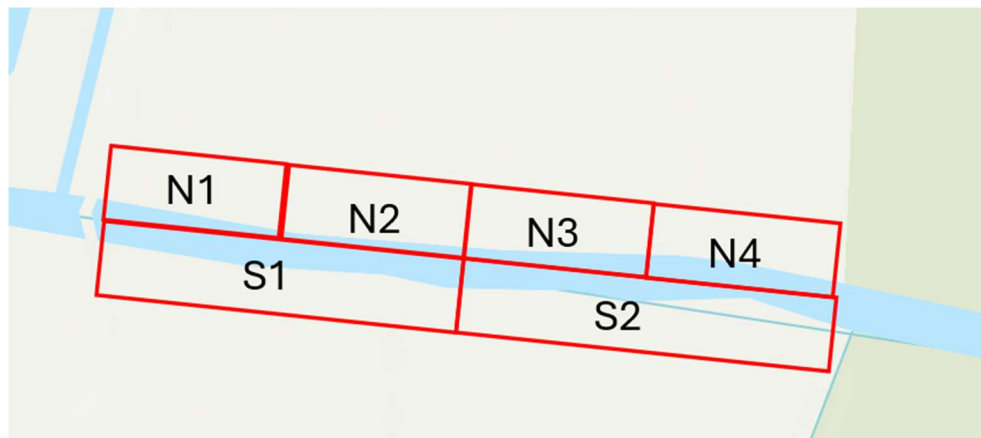
- Drainage channels are dredged on sectional rotation, resulting in complex vegetation cover along its length.
- Scrub/willow has been controlled along the full length of the in-channel area (for ditches which have not been previously shaded)
- Overgrowing willow is prevented from shading previously sunny ditches.
- No non-native invasive species such as Himalayan balsam
- Water levels in the ditch must be no more than 45 cm below the mean field level and the water must have a minimum depth of 30 cm throughout the year.

• Cover of macro-algae is less than 30% in the summer • Common duckweed, fennel pondweed and yellow waterlily together make up less than 75% of the vegetation cover • New Zealand pygmyweed, floating pennywort, waterfern and parrot's feather make up less than 10% of the vegetation cover • Less than 20% of the ditch is in heavy shade (unless the ditch is adjacent to a hedge or within a woodland) and more than 25% has a gently sloping profile or berms and shelves.	
Top Level Management Statements	
• Variance in silt structure in base of ditch is of paramount importance. Complex management is preferable to full length dredging • Emergent vegetation structure should be diversified but maintained. Both sides of a ditch should never be cut in a single season • Care should be taken that changes to ditch management do not affect the hydrology of surrounding land.	
Management Recommendation	Month(s) to Undertake
Note: It must be ensured that correct permissions are in place prior to following any prescriptions laid out below. Some activities may require additional permissions or licenses to be compliant with existing land management schemes or the law.	
Dredge ditches as per an established drainage plan. Spoil to be removed from site or spread elsewhere. Spoil may be deposited along ditch edge if no other cost-effective solution is found, but it should be recognised that this is likely to slow improvements to diversity of any adjacent grassland or fen habitats. See Figure 11 for an example rotation.	October/November (ground conditions permitting. If applicable, this can happen later into winter)
Clearance of colonising willow along full length of unshaded ditches. Removal by root is preferable when the plant is small.	October-February
Thinning overhanging vegetation over shaded channels to create dappled shade on water surface (optional where appropriate).	October-February
Invasive species control. Notably Himalayan balsam. Invasive species should be identified and removed. Herbaceous plants can be pulled out by the root when in flower, woody growth should be removed by the root if possible. Trampling of sedge beds should be minimised during works to avoid disturbance to nesting birds.	June-October (Himalayan balsam. Flowering season for other species).
Non-intervention management is an option for ditches that are not required for drainage of land. Silted ditches will allow surrounding land to become wetter, which can provide biodiversity benefits. Be aware that affecting the hydrology and water movement on a site can affect neighbouring land and may have legal implications that should be explored via	

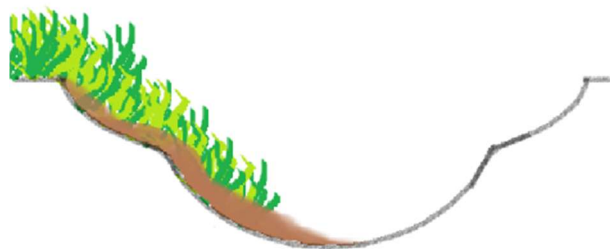


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Buckinghamshire
& Oxfordshire**
Wildlife Trust

Environment Agency before making significant management changes.	
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To create the most diverse ditch possible, dredging each side on a different length of rotation will allow for the development of complex sedimentation depths. Where possible, the rotation should harmonise dredging with cutting, meaning access to the ditch can be easily gained following the cut of one of an adjacent fen compartment.



Section view showing ideal post-dredge profile of ditch, allowing communities to develop at different depths.

		Year									
		1	2	3	4	5	6	7	8	9	10
Dredge	N1	✓				✓				✓	
	N2		✓				✓				✓
	N3			✓				✓			
	N4				✓				✓		
	S1	✓						✓			
	S2				✓						✓

Figure 11 - Example wet ditch management rotation

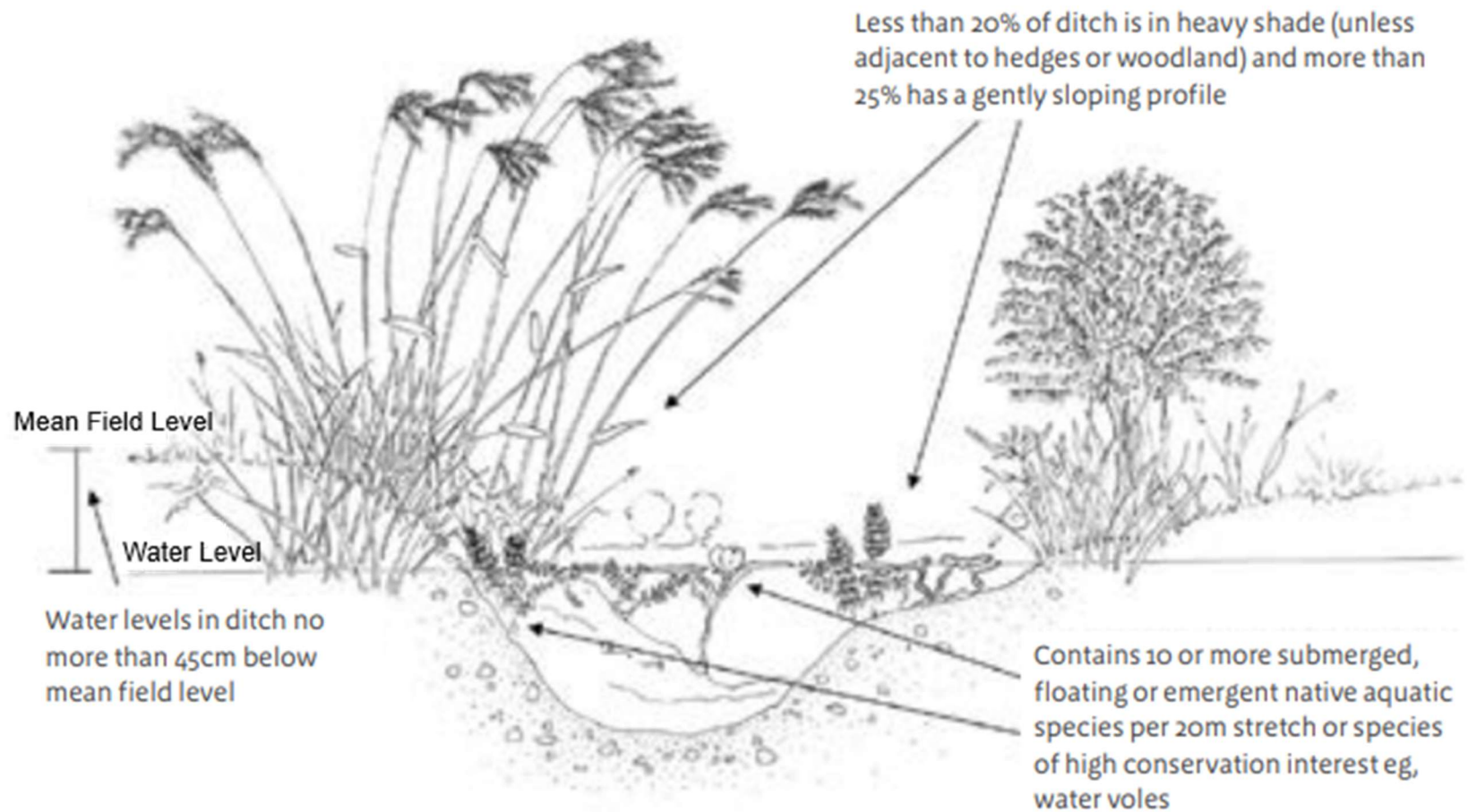


Figure 12 - Example of a Wet Ditch (Taken from Natural England BEHTA Manual)

Trees and Shrubs

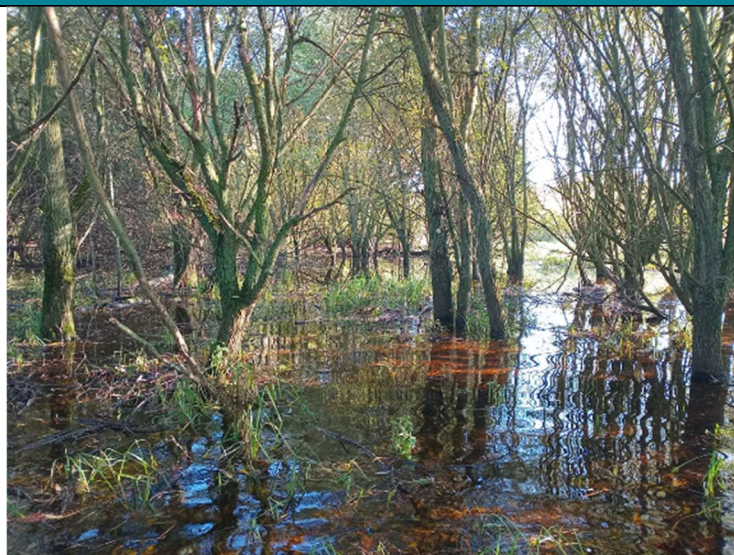
Introduction

Established woody growth is a core part of an effective habitat matrix, particularly where veteran trees and dead wood persist. Where such features are coupled with freshwater, several of our most diverse habitats overlap, creating niches for an abundant range of species. The management of mature woodlands can be minimal, but they reach their maximum potential when connected through the landscape by hedges, coppice and other woody features, including open grown trees.

The long-term nature of trees and woodlands means that succession of existing veteran trees can be easily overlooked, so ensuring continuation in the landscape is essential to the maintenance of a well-connected, nature friendly landscape.

Wet Woodland

Feature Description



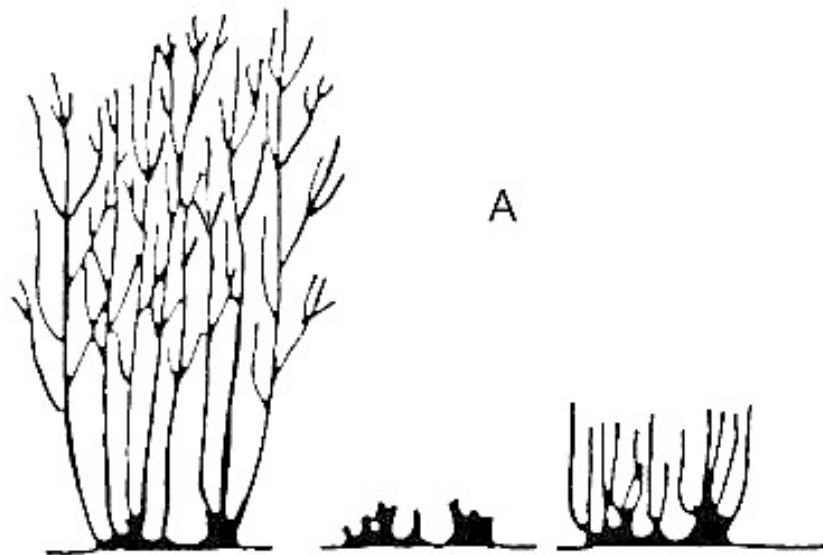
Directly adjacent to the Thames, natural wet woodland will tend to be dominated by willow species and alder, creating a tangled and dense woodland of partly collapsed and regrown trees when the community reaches maturity. The nature of these tree species to split and regrow means that they can pose a threat to navigability of the waterway, so they have often been cleared to prevent ongoing costs.

Where areas of wet woodland have persisted, they provide an excellent pollen and nectar source for early pollinators, an excellent food source for small bird species, notably siskin, and complex cover for species such as otter. Willow overhanging pools forms an egg laying site for the willow emerald damselfly, recently colonised and expanding its range. Root plates and fallen limbs can provide excellent overwintering sites for frogs and toads.

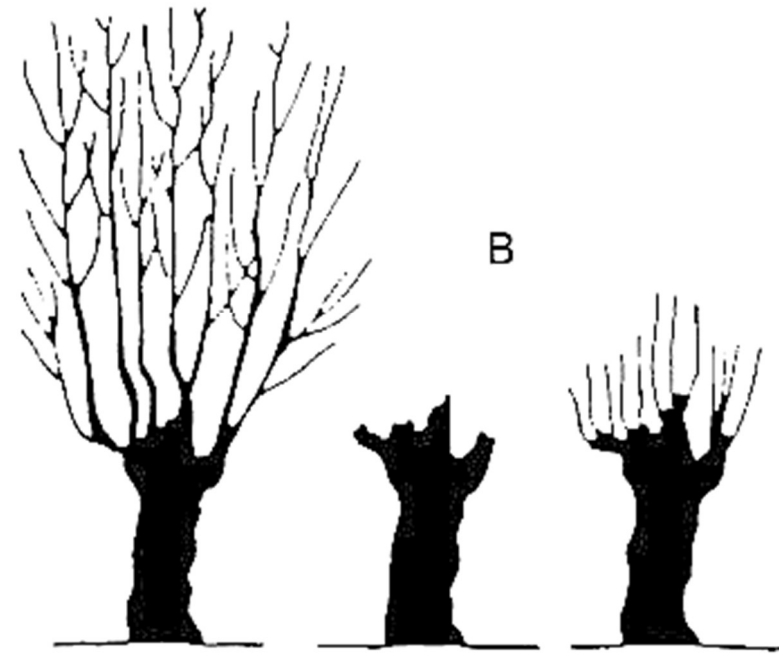
Objectives

- At least 60% with standing water or soft, wet ground
- At least 20% with new woody growth, e.g. coppice regeneration/seedlings

• At least 30% with medium (10-50%) cover of understorey • At least 30% with dense (>50%) cover of understorey • At least 75% with canopy cover • At least 80% of area where willow or alder are the dominant tree species • At least 50% with a good cover of native wetland plants • No non-native invasive species such as Himalayan balsam or bamboo • No more than 25% with nettles, brambles, hemp agrimony or willow-herb species • Large pieces of deadwood present throughout the woodland	
Top Level Management Statements	
• Non-intervention management is a legitimate approach for wet woodland • Creation of areas in coppice/pollard management may increase diversity of ground flora • Maintenance of deadwood habitat is critical to ensure maximum biodiversity	
Management Recommendation	Month(s) to Undertake
Note: It must be ensured that correct permissions are in place prior to following any prescriptions laid out below. Some activities may require additional permissions or licenses to be compliant with existing land management schemes or the law.	
Tree Safety survey inspecting risks to any roads or public rights of way for liability reasons. To be undertaken in autumn to coincide with fungal fruiting body season, allowing easiest identification of decay. Corrective action to be informed by qualified tree surgeon, though trees should be left to collapse naturally if there are no safety concerns.	September - November
Re-Coppicing of existing coupes (areas of coppice). Trees should be cut down to a foot or two above ground level. Leaving some stem above ground allows the long term creation of a complex, above ground bole, which acts as good habitat. Cut material used to maintain dead hedges or brash piles, which can be created around or even over coppiced stools to deter deer browsing. Ensure the tree can grow through piled brash. Stagger cutting of coupes over five to ten year period, ensuring trees in different states exist throughout the woodland. Location of deadwood piles should be aware of floodplain extent to prevent washing into water courses.	October-February
Re-pollarding of established pollards. Trees should have all branches cut back to the main trunk. Cut material used to maintain dead hedges or brash piles, which can be created around pollarded stems to deter deer browsing. Stagger cutting of pollards over five-year period, ensuring trees in different states exist throughout the woodland. Location of deadwood piles should be aware of floodplain extent to prevent washing into water courses.	October-February
Occasional felling of strategic trees to create deadwood and open areas of the canopy. Ensure high value, older trees are left standing. Such management can be achieved simply by allowing collapsed trees to remain in situ where it is safe to do so.	October-February
Invasive species control. Invasive species should be identified and removed. Herbaceous plants can be pulled out by the root when in flower, woody growth should be removed by the root if possible.	June-October (Himalayan balsam. Flowering season for other species).



A – Coppice Stool Silhouette



B – Pollard Stem Silhouette

Figure 13 - Coppice and Pollard Forms

(taken from <https://midwestpermaculture.com/coppicingpollarding/>)

Feature Description



Hedges are valuable habitat features, creating diverse wildlife corridors which, correctly managed, provide shelter, nesting habitat, nectar and fruit sources for a wide range of species. As well as this they can be used to divide larger field parcels allowing greater ease of cutting or greater control in managing grazing regimes, creating the ability to target grazing of critical areas at critical times of year.

In order to promote a healthier hedge, it is suggested that a cutting rotation is adopted, allowing the hedge to be cut less regularly where it does not impact access routes. This will promote health and vigour in the plants as well as providing a broader and more effective shelter belt for small birds. It will also help to promote more rapid growth of the hedges, which can be entered into a hedge laying rotation once they reach a suitable size (5-10cm diameter stems). Such management will create a thicker shelter belt, creating a better shelter for small mammals.

When newly planted, hedges should be interspersed with canopy 'standard' trees, which are not laid but allowed to grow to their full size. These provide structural benefit to a hedge and ensure continued habitat value immediately after laying.

Origins of Objectives

Metrics taken from DEFRA Hedgerow Survey Handbook. It is assumed the ultimate goal is to create a species rich hedge in 'favourable condition'.

Supplemented by metrics taken from Natural England Baseline Evaluation of Higher Tier Agreements (BEHTA) handbook.

Objectives

The hedgerow will be considered to be in good condition when it demonstrates:

- Less than 20% combined cover of nettles, cleavers and docks within 2m either side of hedgerow (not inclusive of areas adjacent to tracks).
- Less than 10% cover of non-native tree/shrub species.
- Less than 20% combined cover of non-native herbaceous plant species within 2m either side of hedgerow (not inclusive of areas adjacent to tracks).
- Average height greater than 1m.

- Average width greater than 1.5m.
- Average cross sectional area greater than 3m².
- Gaps comprise less than 10% of the full length.
- No gaps more than 5m wide (this may be uncorrectable in some cases due to geography of the site).
- Base of canopy less than 0.5m above the ground on average.
- The hedgerow is free from damage caused by livestock or wild animals; including rubbing, bark stripping, soil compaction and browsing of foliage.

Note: It is not possible to assess hedges that have been laid or pollarded in the last five years.

Top Level Management Statements

- Excessive management of hedges should be avoided where this is possible, allowing hedges to 'billow' into wider boundaries
- Diversity of hedge is important. Aim to incorporate species which are beneficial for flowers, fruit and structure if you can.
- Be mindful of structure at all levels of the hedge. Laying and coppicing can be used to create a denser structure at ground level, preventing the hedge becoming gappy and providing denser cover for species using it.

Management Recommendation

Month(s) to Undertake

Note: It must be ensured that correct permissions are in place prior to following any prescriptions laid out below. Some activities may require additional permissions or licenses to be compliant with existing land management schemes or the law.

Undertake annual cutting of trackside hedges only for access reasons. If possible, cut by hand rather than tractor flail, as the latter is likely to more significantly weaken the plant and allow introduction of disease. Step successive cuts out from the last cut by 10-15cm of live wood.

October-February

Undertake cutting of internal compartment hedges as per rotation. If possible, cut by hand rather than tractor flail, as the latter is likely to more significantly weaken the plant and allow introduction of disease. Step successive cuts out from the last cut by 10-15cm of live wood. See Figure 14 below for an example rotation.

October-February

Undertake cyclical hedge laying on long rotation (c.10-30 years) to spread cost and ensure the majority of hedges are standing and fruiting in any given season.

October-February

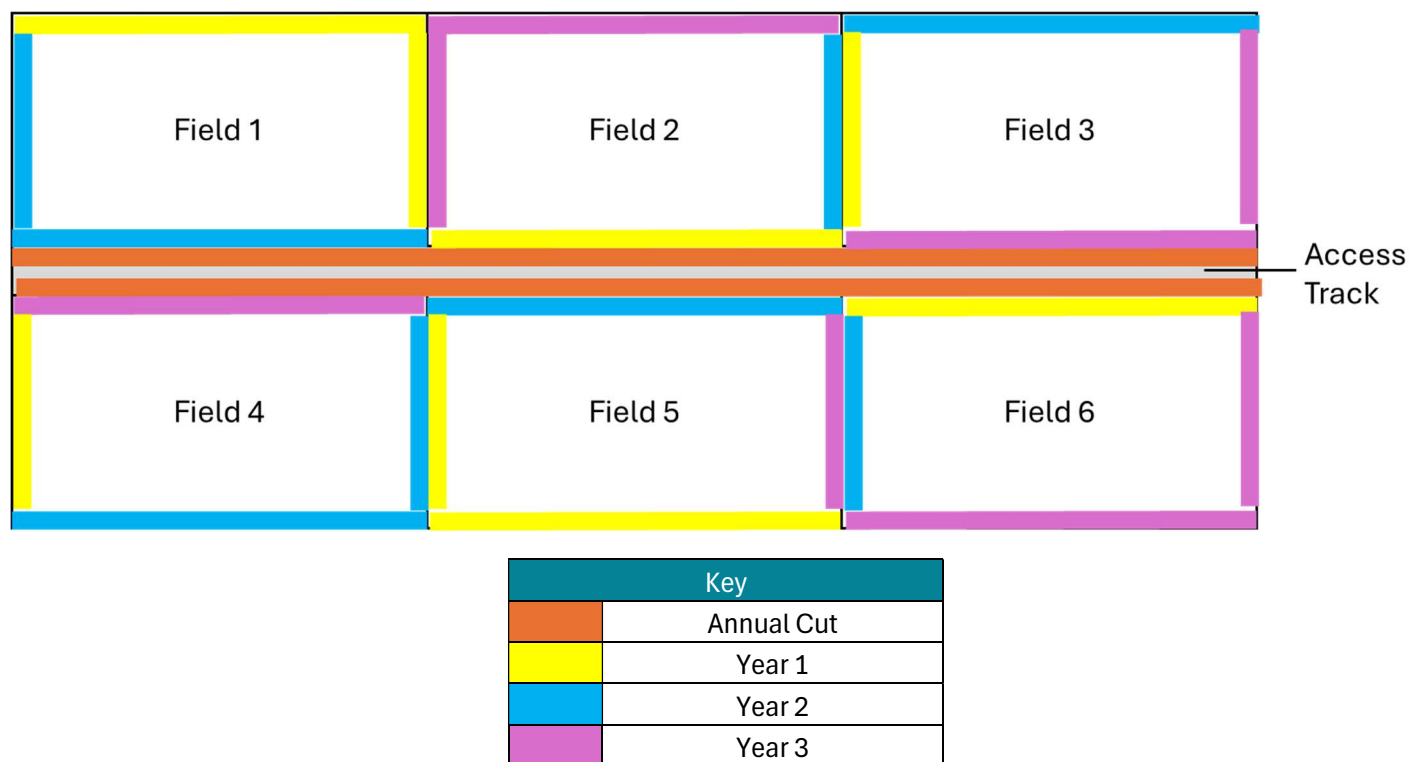
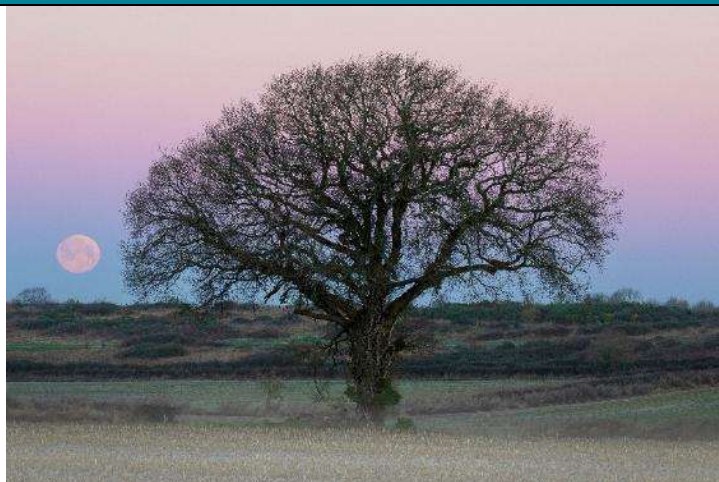


Figure 14 - Example Hedge Cutting Rotation

Common Name	Scientific Name	Common Name	Scientific Name
alder	<i>Alnus glutinosa</i>	hornbeam	<i>Carpinus betulus</i>
apple, crab	<i>Malus sylvestris</i>	lime, large-leaved	<i>Tilia platyphyllos</i>
ash	<i>Fraxinus excelsior</i>	lime, small-leaved	<i>Tilia cordata</i>
aspen	<i>Populus tremula</i>	maple, field	<i>Acer campestre</i>
beech	<i>Fagus sylvatica</i>	oak, pedunculate	<i>Quercus robur</i>
birch, downy	<i>Betula pubescens</i>	oak, sessile	<i>Quercus petraea</i>
birch, silver	<i>Betula pendula</i>	osier	<i>Salix viminalis</i>
black-poplar	<i>Populus nigra</i> sub-species <i>betulifolia</i>	pear, Plymouth	<i>Pyrus cordata</i>
blackthorn	<i>Prunus spinosa</i>	pear, wild	<i>Pyrus pyraster</i>
buckthorn	<i>Rhamnus cathartica</i>	poplar, grey	<i>Populus x canescens</i>
buckthorn, alder	<i>Frangula alnus</i>	poplar, white	<i>Populus alba</i>
cherry, bird	<i>Prunus padus</i>	privet, wild	<i>Ligustrum vulgare</i>
cherry, wild	<i>Prunus avium</i>	rose	<i>Rosa species</i>
dogwood	<i>Cornus sanguinea</i>	rowan	<i>Sorbus aucuparia</i>
elder	<i>Sambucus nigra</i>	service-tree, wild	<i>Sorbus torminalis</i>
elm	<i>Ulmus species</i>	spindle	<i>Euonymus europaeus</i>
guelder rose	<i>Viburnum opulus</i>	walnut	<i>Juglans regia</i>
hawthorn	<i>Crataegus monogyna</i>	wayfaring-tree	<i>Viburnum lantana</i>
hawthorn, midland	<i>Crataegus laevigata</i>	whitebeam	<i>Sorbus species</i>
hazel	<i>Corylus avellana</i>	willow	<i>Salix species</i>
holly	<i>Ilex aquifolium</i>	yew	<i>Taxus baccata</i>

Table 2 - Hedgerow woody species (from Schedule 3 of the Hedgerow Regulations 1997), amended to show most appropriate species for Thames side habitat

Feature Description



Much of the biodiversity value in trees is maximised when they become veterans, i.e. when they develop veteran features such as rot holes, loose bark, dead wood etc. Where it is deemed safe to do so, trees should be left to age naturally, breaking and losing limbs at their own pace. Standing dead tree trunks are particularly valuable habitat, so should not be felled if they pose no risk to infrastructure or property. Where management of standing trees is undertaken, coronet cuts should be considered where the tree poses low risk to encourage the generation of veteran features.

Dead wood should be retained as far as possible to create habitat piles. Deadwood has higher biodiversity value at larger diameter, so fallen wood greater than 20cm diameter should be retained on site. Identification of areas where this is achievable would be beneficial, and must take account of floodplain restrictions.

At sites with a high density of people, livestock or infrastructure, a robust tree safety policy is recommended. In such situations the generation of veteran features in trees can be difficult, but should be striven for long term, especially in more open planted trees in the grassland compartments. Key veteran features are listed in the Objectives section below.

An example tree decision chart is included as Figure 15 to aid decision making around trees that pose a potential issue.

Origins of Objectives

Metrics taken from Natural England Baseline Evaluation of Higher Tier Agreements (BEHTA) handbook.

Objectives

There are a number of possible features that are typical of veteran trees and that add to their environmental interest. If these features are present, you can be more confident in identifying a tree as veteran (See Figure 16 for visualisation of these features):

- a large girth for the tree species
- major trunk cavities or progressive hollowing
- a large quantity of dead wood in the canopy
- naturally forming water pools
- decay holes
- physical damage to the trunk
- bark loss

- sap runs
- crevices in the bark, under the branches, or on the root plate sheltered from direct rainfall
- fungal fruiting bodies (for example from heart-rotting species)
- a high number of interdependent wildlife species
- epiphytic plants
- an 'old' look
- high aesthetic interest

Top Level Management Statements

- Trees are most beneficial when they reach veteran/ancient status. As such, trees need to be considered as a long-term investment, often requiring no intervention where there are no safety requirements.
- Successional planting of trees to ensure the long-term availability of trees of varying ages is very important. Where veteran trees exist, successional planting should be undertaken to ensure scattered trees persist in the landscape.
- Fallen deadwood plays a critical part of the life and habitat cycle of open grown trees. Fallen wood over 20cm in diameter should be left in situ.

Management Recommendation

Month(s) to Undertake

Note: It must be ensured that correct permissions are in place prior to following any prescriptions laid out below. Some activities may require additional permissions or licenses to be compliant with existing land management schemes or the law.

Tree Safety survey inspecting risks to rights of way and publicly accessible areas for liability reasons. To be undertaken in autumn to coincide with fungal fruiting body season, allowing easiest identification of decay. Corrective action to be informed by Tree Work Decision Chart and trained surveyor. Note, this action is only required if trees pose a safety risk.

September - November

Safety works as indicated by survey outcomes. Where there are no or low risks to people, livestock and infrastructure, trees should be left to veteranise naturally.

October-February

Rotational management of veteran pollards to ensure long term survival of veteranising stems.

October-February

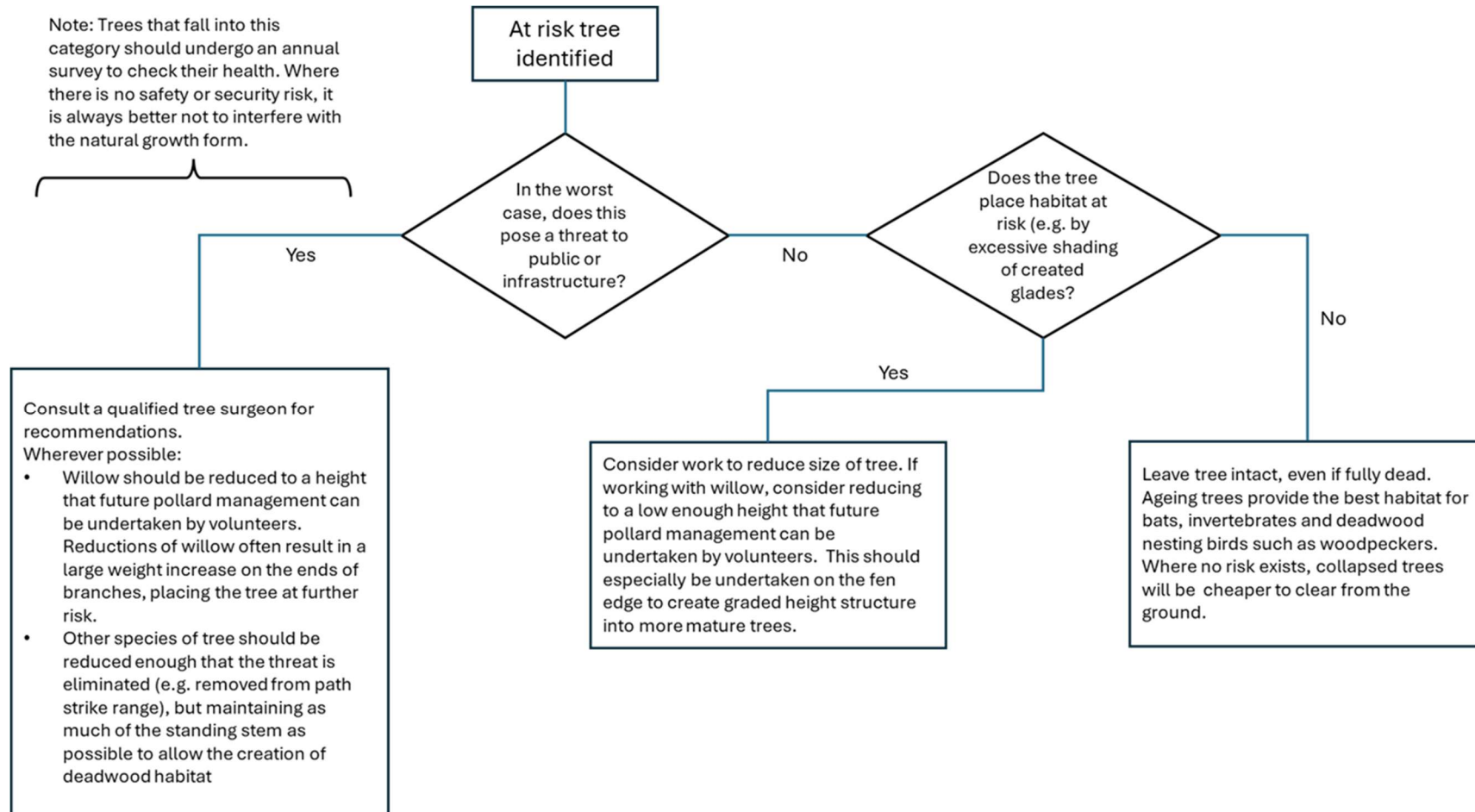


Figure 15 - Example Tree Decision Chart

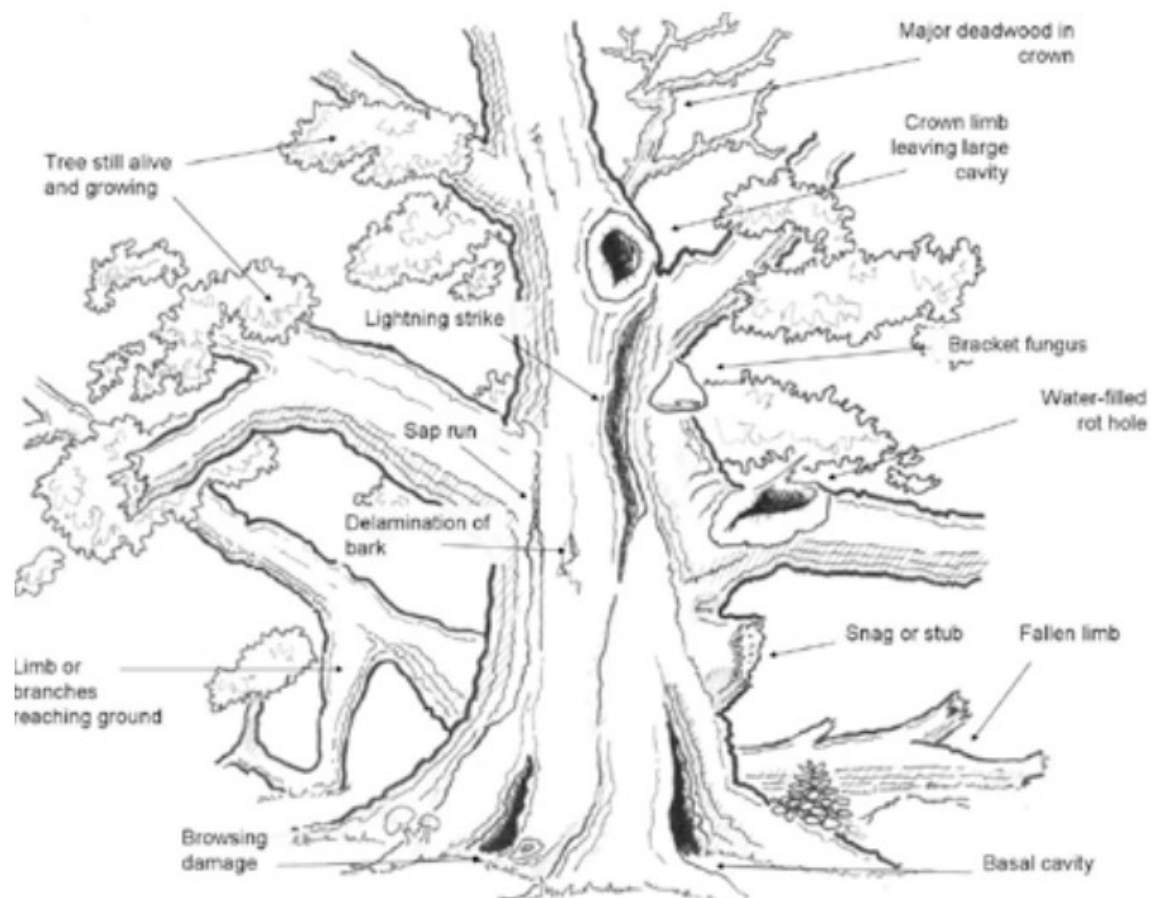


Figure 16 - Examples of veteran features (taken from BEHTA manual)

Third Party Supporting Resources

Third Party Supporting Resources
General
UK Habs Field Key – use if interested to find your specific habitat type
JNCC Priority habitats descriptions
Grasslands
Floodplain Meadows Partnership – Floodplain Meadows Handbook
Plantlife Good Meadows Guide
Natural England Lowland Grassland Management Handbook
DEFRA Soil Sampling Guide
Wetlands
Natural England guidance on Lowland Fens
Devon Wildlife Trust/DBRC lowland fen guidance
The Fen Management Handbook – a major resource for fen management
Freshwater Habitats Trust Pond Creation Hub
Freshwater Habitats Trust Pond Management Hub
Natural England Drainage Channel Biodiversity Manual
People's Trust for Endangered Species guidance on water vole habitat management. Specific management for this species may require some management changes from those laid out in this document
Woodlands and scrub
Natural England Advice on Wet Woodland Management
Devon Wildlife Trust/DBRC Wet Woodland Management Note
DEFRA Hedgerow Survey Handbook
Natural England – Veteran Trees; a Guide to Good Management
People's Trust for Endangered Species – Hedge Management Cycle