Longrun Meadow

Local Wildlife Site Management Plan

10th June 2015

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Date: 10th June 2015

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1.0 Introduction

1.1 Background

In 2012, Somerset Wildlife Trust was awarded funding by the Heritage Lottery Fund for a major urban, community conservation project - 'Routes to the River Tone'.

The project is a partnership between the Environment Agency, Taunton Deane Borough Council, Natural England, British Waterways and the Taunton Deane Area Group.

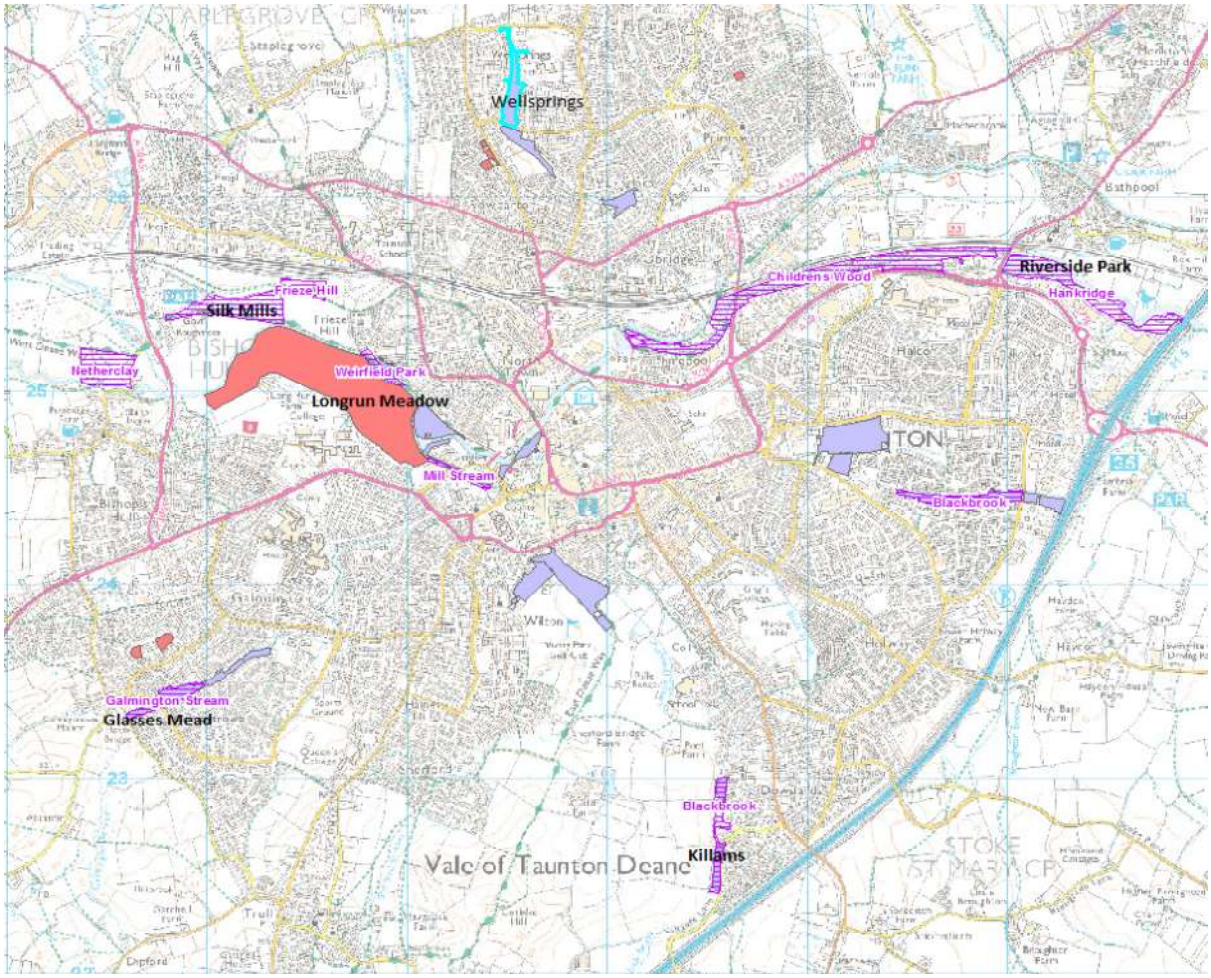
The project is focused around the waterways within Taunton comprising the River Tone, its tributaries and a section of the Bridgwater and Taunton canal which in combination with adjacent open spaces including parks, gardens, allotments and local nature reserves provide key wildlife habitats.

Longrun Meadow is one of the designated Local Wildlife Sites within the Routes to the River Tone scheme. This ten year management plan outlines the key management and conservation objectives of the site within the context of the wider aims of the Routes to the River Tone project.

Period of Management Plan: 10th June 2015 – 10th June 2025.

1.2 Site location

Longrun Meadow is located to the west of Taunton town centre, ST 21476 25093.



Map 1. Location of Longrun Meadow Local Nature Reserve.

1.3 Site History

The site had previously been farmed on an arable basis until 2009/10. The fields were bought through Project Taunton being officially handed over to Taunton Deane Borough Council (TDBC) in 2010 and opened to the public on 28th August 2010. The local community were encouraged by TDBC to establish a Friends Group in order to maximise community involvement in the management of the site. TDBC owns the site and retains responsibility for the management of paths, bridges, mature trees, bin clearing, the control of giant hogweed and the regular mowing of the grass around the barn and in the picnic area. TDBC entered into a trial agreement with The Friends of Longrun Meadow Group for a three year period from February 2014 to February 2017. The Friends Group are responsible for managing the meadows, hedges, ditches, ponds, planted tree areas and the willow cathedral.

The area forms part of the Taunton flood protection scheme with “Flood” field containing a number of attenuation tanks for the storage of flood waters. The Environment Agency imposes a number of constraints in view of this, e.g. agreement is required for tree planting, and these have to be taken into consideration in the management of the site.

The Friends of Longrun Meadow currently consists of eight committee members and has a conservation group with 10 regular volunteers.

The Friends Group have succeeded in gaining funding through the Entry Level Stewardship Scheme for "Buttercup" and "Willow" fields as part of a 5 year programme. The Friends of Longrun Meadow have also been awarded a nesting box as part of the Somerset Wildlife Trusts Barn Owl Project 2012-15 which aims to get a nest box in each of the county's 335 parishes and boost the numbers of breeding barn owls. They have also received a Mayor's grant of £500 as part of the "Bees and Trees" project which commences in September 2015 and runs for 3 years.

1.4 Site description

Longrun meadow covers an area of 286.7ha.

The River Tone flows along the eastern and northern boundaries of the site, which consists mainly of previously cultivated and amenity grassland. The site is divided into four fields by three well established hedgerows composed of native species including, hazel (*Corylus avellana*), blackthorn (*Prunus spinosa*), hawthorn (*Crataegus monogyna*), English elm (*Ulmus procera*) and occasional field maple *(Acer campestre*) and elder (*Sambucus nigra*). These hedges have ditches on both sides as well as a 2 meter margin of rough grass to provide a habitat for voles and mice. They also contain occasional pedunculate oaks (*Quercus robur*) some of which display veteran features.

A hedge follows the southern boundary of "Flood", "Willow" and "Buttercup" fields, the mature portions of which are composed as described above, including the occurrence of occasional large pedunculate oaks (*Quercus robur*) with veteran features and a ditch. An establishing hedge occurs in a large section of the "Flood" field boundary and includes, hazel (*Corylus avellana*), field maple *(Acer campestre*), Guelder-rose (*Viburnum opulus*) and dogwood (*Cornus sanguinea*). Similar new hedges have been planted in the area around the large pond and near the river in "Flood" field.

A small area of semi-natural broadleaved woodland occurs around the large pond located between "Flood" and "Willow" fields. This consists mainly of goat willow (*Salix caprea*) but includes alder (*Alnus glutinosa*) and elder (*Sambucus nigra*).

Blocks of broadleaved woodland have been planted in all four fields. Blocks with mixed woodland include species such as ash (*Fraxinus excelsior*), alder (*Alnus glutinosa*) and pedunculate oak (*Quercus robur*). Homogenous blocks, mainly located in "Willow" field, consist of single species such as hazel (*Corylus avellana*) and goat willow (*Salix caprea*). These plantations are still establishing being less than six years old. The exception is the block located in the northern apex of "Flood" field which contains well established trees. "Willow" field also contains the willow cathedral, a structure crafted out of living willow.

Two ponds are located within the site. The small pond situated in the western most attenuation tank of "Flood" field appears to be groundwater fed and attracts a number of species of damsel and dragonfly including azure damselfly (*Coenagrion puella*), emperor dragonfly (*Anax imperator*) and broad-bodied chaser (*Libellula depressa*). A fairly large area of this pond is dominated by yellow iris (*Iris pseudacorus*). The larger pond has a significant amount of emergent vegetation and is heavily shaded by mature goat willow *(Salix caprea*).

A channel linking the pond to the River Tone is only subject to water flows in high winter water levels or during flooding events.

The riverside margin consists of scattered broadleaved trees, many of which are mature with some veteran features, interspersed with moribund trees which provide valuable dead wood for saproxylic flora and fauna, and large areas of tall herb/ruderal vegetation, including extensive beds of common nettle (Urtica dioica), broad-leaved dock (Rumex obtusifolius), comfrey (Symphytum officinale) and ragwort (Senecio jacobaea). The invasive non-native species Himalayan balsam (Impatiens glandulifera) and giant hogweed (Heracleum mantegazzianum) occur widely across the site.

The flora species present in the grassland are relatively few in number, including black medick (*Medicago lupulina*), broad-leaved dock (*Rumex obtusifolia*), bulbous buttercup (*Ranunculus bulbosus*) and dandelion (*Taraxacum officinale agg.*). Notable species occurring include Ragged robin (*Lychnis flos-cuculi*), hoary cinquefoil (*Potentilla argentea*) and hairy buttercup (*Ranunculus sardous*).

While the fields are generally species poor at present, the hedges, ditches and ponds provide greater ecological interest with a wider range of species noted in the flora and fauna surveys undertaken thus far. Lying dead wood has been established in a number of places to provide habitat for fungi and saproxylic fauna.

An active badger sett was noted near the western boundary of “Flood” field. Water voles have also been noted on the reserve as well as some species of bat, notably soprano and common pipistrelles and possibly Daubenton’s bats.

2.0 Management Strategy and Objectives

2.1 Management strategy

The stated management aims of The Friends of Longrun Meadow Group are:

1. To encourage people to explore the living landscape and take part in and appreciate the management processes which are happening.

2. To create sustainable habitats to increase bio diversity of the area

3. To maintain the area for people to enjoy nature and outdoor activity.

4. To educate people in the sustainable nature of land management. To encourage informal and formal education and skill development with young people and adults utilising volunteers and public funding to support events, apprenticeships and training programmes. All geared towards education for the Living landscape in an urban environment.

5. To integrate the Roughmoor pond (Silk Mills park and ride) with Longrun.

6. To form a west of Taunton 'Green group' in order to connect adjoining green areas.

2.1.1 Habitat specific management objectives 2010 - 2014

Habitat specific objectives within the stated strategy were:

Ponds:
Dredging.
Reduction of shading through pollarding and tree removal.
Removal and control of invasive native and non-native vegetation.

Ditches:
Promote biodiversity in conjunction with the hedges.

Hedges:
Establish a hedge maintenance programme on a rotational basis, i.e. hedge laying.
Fill in gaps in hedgerows and improve connectivity across the site.
Promote biodiversity by planting a wide range of native species.

Woodland:
Plant fruit trees where appropriate.
Manage establishing plantation woodland through coppicing.
TDBC/DLO to manage mature trees across the site as required.

Grass Cutting:
Regular mowing of amenity grassland by DLO in picnic area in "Oak" field.

Meadows:
Manage "Buttercup" and "Willow" fields in accordance with ELS conditions, i.e. taking hay cut each year to reduce fertility. Cut to be taken after 1st July.
Establish 2 meter border alongside all internal hedgerows to provide habitat for voles and mice.
Develop floral diversity by establishing a species rich wild flower meadow in "Willow" field.

Control of shrub, native and non-native invasive vegetation:
DLO required to control giant hogweed (Heracleum mantegazzianum)across the site.
Control of dock (Rumex sp), ragwort (Senecio jacobaea), Himalayan balsam (Impatiens glandulifera), etc., across the site.
Control of shrub, especially bramble (Rubus fruticosa) as appropriate.

Bird and bat boxes:
Located 7 nest boxes as appropriate across the site, and a barn owl box as a focus species (see below).

Focus species:
Implement programme to benefit barn owls.

Surveys:
Implement programme of biodiversity surveys.

2.2 Habitat specific and general management objectives 2015 – 2025

The management objectives for the site are summarised in table 1 below.

Habitat Type	Key Objectives	Aim of objective	Responsible body/organisation	Programme year(s)
Ponds				
	Create two additional ponds in Flood Field attenuation tank 3. Restore existing smaller pond in attenuation tank. Design new ponds to make them easily accessible.	To provide a resilient network of habitats suitable for aquatic flora and fauna, especially for damsel and dragonflies. Establish an educational facility to augment those already existing.	Friends Group with advice from SWT?	Years 1 - 3
	Reduce shading around the large pond near the river in Flood Field.	To encourage increased biodiversity by attracting shade intolerant fauna and to assist in controlling nutrient levels.	Friends Group and TDBC where management of mature trees is required.	Years 5 – 6 for shading.
	Control extent of flag iris in both existing ponds.	To maintain extent of open water habitat and establishment of a diverse range of emergent vegetation to	Friends Group	Annual basis as required.

		encourage biodiversity.		
Ditches				
	Fill in ditch on one side of hedge.	To improve access to hedge for maintenance purposes and establish additional 2m strips of rough grass habitat for voles and mice.	Friends Group/ advice from SWT/other interest groups	Years 1 -5
	Enlarge remaining ditch, possibly with "scalloping" and implement system to maintain water levels in the ditch.	To establish an aquatic ditch habitat and to improve biodiversity.	Friends Group/advice from SWT/other interest groups	Years 1-5
Hedges				
	Maintain an effective programme of hedge management on a rotating basis.	To promote healthy and vigorous hedge growth and maintain an optimal habitat for wildlife. To manage Dutch elm disease if present. To provide coppice and other timber products for community use.	Friends Group/ advice from SWT/other interest groups	Years 1 - 10
	Continue hedge planting programme to fill in gaps and improve connectivity with other hedges and woodland areas across the site.	To establish a contiguous hedge network to provide movement corridors, suitable nesting habitat and food sources across the site for a wide range of species.	Friends Group/ advice from SWT	Years 2-5
Woodland				
	Coppice willow and hazel plantations	To maintain and manage the plantations and provide timber resources for willow crafts,	Friends Group/advice from SWT and other interest groups.	Years 3 – 10 for hazel.

	and remove tree guards and posts from all relevant trees.	woodworking, etc., for community, educational and other purposes.		Years 1 – 10 for willow. Year 1 for removal of tree guards and posts.
	Establish modest numbers of fruit/other trees where possible and with the appropriate consents.	To increase biodiversity and provide an additional community resource.	Friends Group/ advice from SWT	Years 2-4
Meadows				
	Continue to manage grassland and take hay cut as stipulated by ELS conditions in buttercup and willow fields for the remainder of the agreement term.	To meet ELS commitments and to continue to reduce nutrient levels and to facilitate the provision of pollen and nectar resources for a wide range of species.	Friends Group	Annual basis
	Increase floral species diversity in Willow field by developing a wild flower meadow.	To increase biodiversity and provide improved resources for a greater range of species. To provide enhanced aesthetic appeal for public enjoyment.	Friends Group/advice from SWT/other interest groups as appropriate, e.g. plant life	Years 1-10
	Extend areas of 2m strips of rough vegetation around field	To provide further habitat for small mammals as a resource for predators, especially for barn owls as part of	Friends Group/advice from SWT	Years 2-6

	edges.	our involvement in the barn owl project.		
General Management Activity	**Key Objectives**	**Aim of objective**		
Grass cutting				
	Ensure TDBC maintain regular mowing regime in Oak field as required (1)	To maintain grass height at suitable level in picnic/communal areas.	TDBC	Annual basis
Tree Management				
	Ensure TDBC undertake felling, pollarding, limb removal etc., as required on mature trees within their remit.	To maintain tree health, meet the conservation aims of the LWS and to ensure public safety is maintained.	TDBC	Annual basis/as required
Invasive non-native and native weed control				
	Control of pernicious weeds such as Himalayan balsam, ragwort and creeping thistle.	To minimise impacts of these species across the site.	Friends Group/advice from SWT	Annual basis
	Ensure TDBC control Giant Hogweed across the site.	To minimise the impact of this species across the site and to maintain public safety.	TDBC	Annual basis
Bird and bat boxes				
	Maintain existing bird	To provide a wide range of nesting opportunities	Friends Group/advice from	Annual basis

	nest boxes and expand the number of boxes sited where possible.	for the largest number of species possible, especially focus species such as barn owls.	SWT and other interest groups	
	Establish a network of bat boxes at suitable sites across the reserve.	To provide a wide range of roosting opportunities for the largest number of species possible, especially focus species.	Friends Group/advice from SWT/Somerset Bat Group	Annual basis
Focus species				
	Maintain and protect established badger sett.	To maintain the presence of the species on the site and to meet legal obligations under wildlife legislation.	Friends Group	Annual basis
	Continue to participate in the barn owl project.	To provide suitable foraging habitat and nesting opportunities for the species.	Friends Group/SWT	Annual basis
	To identify other potential focus species which could utilise the reserve and provide suitable resources accordingly.	To improve biodiversity and provide further opportunities for public engagement/educational activities.	Friends Group/advice from SWT and other interest groups	As opportunity arises.
Surveys				
	To carry out a range of surveys and submit the records to SERC.	To establish an extensive monitoring programme, provide opportunities for public engagement/educational activities and to supply accurate data to SERC for wider conservation purposes. Priority in year one is to carry out bat activity	Friends Group with advice from SWT/SERC and other specialist groups.	Establish in year one and continue on an annual basis as resources permit.

		surveys and receive training to carry out botanical surveys.		

Table 1. Summary of Management Objectives 2015 -2025

2.3 Implementation of objectives and recommendations

2.3.1 Ponds

- **Pond creation.**
  The creation of the two new ponds will require the consent of the Environment Agency. The existing pond in attenuation tank three in Flood field is fed by the water table and is subject to large seasonal variations in water levels.
  Recommendations: It is recommended that new ponds be constructed in a manner which compensates for this, i.e. they have a large shelving drawdown zone around the edge and a deeper central portion which will prevent the total drying up or freezing of the ponds. A large drawdown zone also improves safety of the pond and facilitates access. The creation of these ponds could provide opportunities for community engagement. Further detailed guidance on pond creation can be found on the Freshwater Habitats Trust website at: www.freshwaterhabitats.org.uk/projects/million-ponds/pond-creation-toolkit/.

- **Pond restoration.**
  As already noted, the existing pond in attenuation tank three in Flood field is subject to large variations in water levels. Emergent vegetation has also increased significantly in this pond and requires control. The sides of the pond are quite steep in many places resulting in a poorly defined drawdown zone and reducing the potential for a greater variety of species of vegetation to become established.
  Recommendations: Subject to gaining any consents which may be required, the pond could be deepened and the drawdown zone enlarged and extended around the pond to encourage greater diversity of invertebrates and vegetation. Further guidance on pond restoration is given in Appendix A.
- **Reduction of shading and reconnection of large pond to river.**
  Shading of this pond, mainly by willow trees (*salix sp.*), exceeds 75%. A number of the trees concerned are relatively young but one very large and mature goat willow (*Salix caprea*) occupies a lateral position into the pond and contains some veteran features. The channel which formerly connected the pond to the River Tone is now partially filled in at the end nearest to the river. It has been suggested that this could be dug out to reconnect the pond with the aim of maintaining water levels to prevent seasonal drying out.

Recommendations: A rotating programme of pollarding younger willow trees can be initiated to reduce shading, e.g. selecting two to three trees at a time at various points around the pond perimeter. It is recommended that the large willow with veteran features is left in-situ. Pollarding is not a suitable management method for this tree. Instead, a judicious reduction of carefully selected limbs could reduce shading and promote the health of the tree. Due to their special habitat value, lateral limbs should be retained wherever possible. Further guidance on the management of veteran trees and pollarding is given in Appendix A.

It is not known whether great crested newts are present in this pond. It is recommended that a GCN survey is carried out as a prelude to any major restoration work in connection with the pond. Should GCNs be shown to be present it is recommended that any works undertaken are designed to minimise impacts on great crested newts.

- **Control of invasive vegetation.**
  Flag iris (*Iris pseudacorus*) coverage has increased significantly and requires control as does the occurrence of Himalayan balsam (*Impatiens glandulifera*).
  Recommendations: Flag iris can removed during normal pond maintenance operations in the winter months. Himalayan balsam should either be pulled or cut and as long as no seed heads have formed this material can be sent for composting or left in-situ. The optimal time for this is late May into June prior to seeds developing but late enough in the season to prevent re-growth. Further guidance in relation to invasive plant control is given in Appendix A.

2.3.2 Ditches

- **Infilling of ditch on one side of hedges 1,2 and 3.**
  This objective is intended to improve access to the stated hedges in order to facilitate the effective management of the hedges. The resulting ditch loss will be compensated for by enlarging the remaining ditches on the western side of each hedge. The ditches on the eastern side were found to be largely dry. It also appeared that most, if not all of the ditches were disconnected from the drainage network in the area and certainly did not discharge into the river.
  Recommendations: Subject to gaining any consents which may be required it is recommended that this objective could proceed without any adverse ecological effects. Arisings from the works to enlarge the western ditches and from pond creation/restoration works could be used as infill material. There is the potential for community engagement in carrying out this objective.
- **Enlargement of Ditches and Water Management for Hedges 1 and 2.**
  The objective is to enlarge the western ditches for each hedge one to three preferably using “scalloping” to create an extended edge habitat. There is the

potential to reconnect the ditches associated with hedges one and two to the river and to maintain water levels accordingly.

Recommendations: The ditches can be enlarged by creating a continuous shelving berm on the field edge and incorporating scallop shaped hollows periodically along its length.This will provide a valuable habitat for a large range of invertebrate and plant species, especially if carried out in conjunction with a water management programme. The exact dimensions of the berm and scallops should be ascertained via a further site inspection; for general guidance the scallops should be approximately 2 meters wide, shelving down to about half the ditch height and spaced 20 – 30 meters apart.

Consent may be required to reconnect the ditches to the river. Assuming such consent is forthcoming, the water levels in the ditches could be maintained by a sluice system. The resulting habitat will provide a significant increase in biodiversity. There is the potential for community engagement in carrying out this objective.

2.3.3 Hedges

- **Hedge Maintenance.**

  A programme of hedge maintenance through coppicing and laying as appropriate is to be maintained and extended. Small lengths of hedge two have been layed at the northern end. However, the presence of the ditches on either side of each hedge has presented a barrier to extensive hedge management. Hedges one to three are large and hedge three is dominated for much of its length by elm species. At least three elm trees have died in recent years which may indicate that Dutch elm disease is present.

  Recommendations: Detailed guidance in relation to hedge management is given in Appendix A. However, specifically, the management of elm species in hedge three may require coppicing of sections of hedge, especially those in close proximity to plants which have died, as a means of controlling the spread of the disease should it be present. There is the potential for community engagement in carrying out this objective.

- **Infilling gaps with new planting.**

  A number of gaps within and between hedges are targeted for infilling with a range of native species, including hawthorn (*Crataegus monogyna*), hazel (*Corylus avellana*) and wayfaring tree (*Viburnum lantana*), to provide a range of foods for wildlife and improve connectivity.

  Recommendations: Continue programme of infilling and improving connectivity. Detailed guidance regarding planting new hedges is given in Appendix A.

2.3.4 Woodland

- **Coppice/pollard hazel and willow plantations.**

The objective to harvest hazel and willow timber from the plantations for community use as a by-product of woodland management applies to the plantations in willow field.

Recommendations: The hazel plantation is still establishing and it is recommended that any coppicing is deferred for a further 3 – 4 years, i.e. 2018/19. A rotating programme of pollarding/coppicing of the willow plantation can be initiated from year one of this plan if desired. Further details are given in Appendix A. There is the potential for community engagement in carrying out this objective.

- **Mixed plantations.**

  The aim is to manage the mixed plantations effectively.

  Recommendations: It is recommended that a policy of minimal intervention is applied to these plantations to allow the trees to establish further. In years 5 – 10 of this management plan a programme of crown raising could be considered to reduce any potential issues during flooding events.

- **Limited planting of new trees.**

  The Friends Group hope to plant a limited number of trees adjoining existing hedges and blocks of trees in order to "soften" the linear boundaries of the tree plantations and merge the plantations with the hedge in some places.

  Recommendations: Subject to the appropriate consents being granted, a range of tree species, including fruit trees could be considered for planting to increase biodiversity. Trees which could be considered include, apple (*Malus sp*.), pear (*Pyrus sp.*), Oak (*Quercus robur*), Rowan (*Sorbus aucuparia*) and field maple (*Acer campestre*). Further details regarding tree management and planting are given in Appendix A.

2.3.5 Meadows

- **Management of willow and buttercup fields under ELS.**

  These fields will continue to be managed in accordance with the ELS agreement for the remainder of the term.

  Recommendations: Continue to manage field in agreement with farmer for harvesting of any hay crop after 1st July to maintain floral biodiversity, etc.

- **Increase biodiversity of flora in Flood field.**

  The Friends Group aim to harrow an area in attenuation tank 2, in Flood field, in September 2015 and sow yellow rattle seed. Once established, in September 2016 wildflower seed will be sown in this prepared area to try and establish a wildflower meadow.

  Recommendations: It is recommended that soil samples are taken in the proposed treatment area to identify pH and key nutrient status and to identify the most

appropriate seed mix for the site. It may also be helpful to obtain up to two soil core samples to ascertain the structure of the substrate within the floor of the attenuation tank, i.e. to determine degree of compaction, stone content, etc., as these factors will also affect the effective establishment of wildflower seed. Seed should be sourced from a locally approved supplier. There is the potential for community engagement in carrying out this objective. Further details on sources of seed and the establishment of meadows are given in Appendix A.

- **Extending 2m strips of rough vegetation.**
  Further 2m wide strips of rough grass and forbs are planned for the borders of fields and along hedgerows, especially where hedgerow ditches have been filled in. These provide excellent habitat for small mammals and is a means of encouraging owls and other birds of prey to the site.
  Recommendations: Ensure that the organisation/individual tasked with leaving strips uncut is adhering to the instruction.

2.3.6 Grass cutting and mature tree management.

- **Mowing regime in Oak field.**
  The TDBC DLO is responsible for this in the picnic area and around the oak barn.
  Recommendations: Ensure that the mowing regime is clearly established on an annual basis and that it is implemented in line with the agreed timetable/frequency.
- **Mature tree management.**
  The Environment Agency are responsible for tree maintenance on the riverside margin. TDBC DLO are responsible for the management of mature trees across the remainder of the site.
  Recommendations: Ensure the DLO is aware of their obligations to maintain tree health and public safety across the site and to assist in maintaining the conservation value and beneficial management of the nature reserve.

2.3.7 Control of shrub, native and non-native invasive vegetation

- **Control of pernicious weeds.**
  The control of Himalayan balsam, ragwort and other invasive weeds across the site is planned through cutting and pulling as appropriate. Guidance is provided in Appendix A.
- **Control of giant hogweed.**
  TDBC are responsible for controlling this weed.
  Recommendations: It is recommended that TDBC is notified of the location of all identified plants as soon as possible and their control measures are monitored to establish the effectiveness of their actions.

2.3.8 Bird and bat boxes

- **Bird nest boxes.**
  Seven bird boxes were sited on trees around the large pond and their use monitored. Also, an owl box has been sited in a mature pedunculate oak in hedge 3.
  Recommendations: Identify other opportunities to site further nest boxes across the site and monitor their use. Further guidance is given in Appendix A.
- **Bat Boxes.**
  No bat boxes are currently located on the reserve.
  Recommendations: It is recommended that at least one and preferably more, bat transect surveys are carried out, possibly in conjunction with SWT, to help establish the species present and to inform the type and location of the most appropriate bat boxes. Further guidance is given in Appendix A. There is the potential for community engagement in carrying out this objective.

2.3.9 Focus species

- **Badgers and barn owls.**
  These are the current focus species. However a number of species either occur on or could be encouraged to use the site.
  Recommendations: The Friends Group could carry out a range of surveys to identify potential species which could be targeted for further help, e.g. through providing suitable habitat and food resources or expanding upon an exisiting habitat on the site to help consolidate the population of the species.

2.3.10 Surveys

- A programme of surveys is planned to establish a baseline of species present and to assist in monitoring trends on the site, in particular bat surveys in year one and training for carrying out botanical surveys from year two et seq.
  Recommendations: It is recommended that as many surveys as possible are carried out utilising in-house expertise and expertise from other specialist groups as appropriate, e.g. Somerset Invertebrates Group, Somerset Botany Group, etc. The data should be submitted to SERC, (contacts, Cathy Horsley and Paula Hewitson), for monitoring and conservation purposes. There is the potential for community engagement in carrying out this objective.

3.0 Long-Term Aspirations

The long-term objectives within this management plan period are summarised in Table 2 below.

Long-term Aspiration	Benefits	Years in Plan
Improve the species richness of the fields for the enjoyment of all and for educational	Aesthetic, cultural and educational benefits. Increased pollen and nectar	6 -10

activities and botany surveys.	resource for a greater range of invertebrates and a general increase in biodiversity.	
Develop a varied pond habitat.	Provide an extensive and resilient range of pond habitats to appeal to a broad number of invertebrate and plant species. Provide community and special interest engagement opportunities.	5 - 10
Develop a quality green space for local people.	Provide opportunities for people to engage with nature, enjoy their local green space and benefit from enhanced cultural and educational opportunities.	5 - 10

Appendix A – Further Guidance

Pond restoration

Every pond is individual and needs to be managed as such or wildlife may be lost, or the best may not be gained from efforts to maintain it. Unmanaged ponds will naturally undergo succession, and all stages will support wildlife but the drawdown zone between the highest and lowest water levels in an average year is particularly important in supporting a diversity of species. Half a metre distance in water level during the year is normal and essential, and occasional, total drying, particularly in very late summer or early autumn, will benefit amphibian breeding and juvenile recruitment due to the absence of fish predators.

Pond vegetation management

Pond dwelling species interact with habitats in their immediate vicinity and for this reason a properly managed buffer zone around the pond, is very important. It is best to allow sparsely vegetated ponds to re-colonise naturally and too much vegetation is better than too little as few species rely on open water. However, dominating plants should be thinned out (unless there are compelling reasons for complete removal) where they may be supressing slow-growing, minority species.

During vegetation removal operations conspicuous animals should be picked off or rinsed out of extracted plants or allowed to return to the pond of their own accord by temporarily leaving removed vegetation beside the water. However, this vegetation must be piled away from the pond before the onset of decay to prevent nutrient enrichment of the pond.

Algae (e.g. blanket weed), duckweeds and water ferns can form thick mats across the water surface blocking out light to submerged aquatic plants and preventing exchange of gases with the air so that the underlying water can become de-oxygenated and noxious to aquatic animals. Therefore, expansive growths across small ponds should be netted up with a fine-meshed sampling net.

Pond tree and shrub management
Coppice or pollard diseased trees and shrubs, particularly on the southern side of the pond as these reduce the amount of sunlight reaching the water and inhibit aquatic plant growth.

Cutting to ground level will encourage new growth in most trees and shrubs and so a coppicing cycle involving the cutting of a third of trees and shrubs every two years will produce a varied vegetative structure. To reduce the amount of coppicing required, remove roots to stop regrowth. Chemical treatment of cut roots should be avoided due to the risk of pond contamination.

Fallen branches and rubble piles within the water and bankside woodpiles constructed from felled material can create valuable habitat. However beware that this does not encourage more branches to be thrown in or lead to destructive human interference.

Timing
The best time of year to restore a pond is November to January to minimise disturbance to wildlife. Avoid clearing vegetation and de-silting in harsh weather, to minimise exposure of disturbed fauna.

Protected species
Great crested newts are protected from intentional or reckless killing, injury or capture and their habitat is protected from damage or destruction under the Wildlife and Countryside Act 1981 and Conservation of Habitats and Species Regulations 2010.

As such, if great crested newts (or their larvae) are found during pond restoration, operations should avoid harming individuals or causing damage to occupied habitat. In uncertain situations, cease operations and seek expert advice.

Hedgerow
Tree and shrub planting is of greatest benefit to wildlife if it is done in groups or belts rather than individually scattered over a wide area. Many species of birds require the habitat created by planting groups of trees and shrubs together as they are not able to take full advantage of individual specimens.

Hedgerow types
Maintaining a diversity of field boundary types will suit the needs of the widest range of species:

- Birds: Partridges, linnets *Carduelis cannabina* and yellowhammers *Emberiza citrinella* prefer short hedgerows (of under 2 metres) with grass margins. Song thrushes *Turdus philomelos* and turtle doves *Streptopelia turtur* prefer wide hedgerows over 4 metres tall. Many hole-nesting birds such as tree sparrow *Passer montanus* can use old hedgerow trees. Corn buntings *Miliaria calandra* prefer field boundaries in the form of hedgeless wide grass banks.
- Dormice *Muscardinus avellanarius* benefit from tall, fruiting species rich hedgerows linking woodlands.
- Reptiles are commonly associated with networks of hedgerows with dense understory vegetation which provides protection from predators and important links between habitats.
- Invertebrates sometimes favour older hedgerows containing a large amount of dead wood and plant litter within the structure of the hedge.

Hedgerow planting

The best species to plant are those which occur locally and are therefore suited to the local conditions (Table 4). Native trees and shrubs are the most valuable because:

- they support a much greater variety of animals and plants than introduced species;
- they thrive in particularly harsh local conditions; and
- they are more likely to survive and flourish than most introduced species.

Table 4: Suitable hedgerow trees and shrubs

Trees		**Shrubs**	
Common name	**Binomial name**	**Common name**	**Binomial name**
Ash	*Fraxinus excelsior*	Alder Buckthorn	*Frangula alnus*
Aspen	*Populus tremula*	Blackthorn	*Prunus spinosa,*
Alder	*Alnus glutinosa*	Broom	*Cytisus scoparius*
Beech	*Fagus sylvatica*	Butchers Broom	*Ruscus aculeatus*
Bird Cherry	*Prunus padus*	Dogwood	*Cornus sanguinea*
Black Poplar	*Populus nigra*	Elder	*Sambucus nigra*
Common Lime	*Tilia x europaea*	field maple	*Acer campestris*
Common Oak	*Quercus robur*	Goat Willow	*Salix caprea*
Crab-apple	*Malus sylvestris*	Guelder Rose	*Viburnum opulus*
Crack Willow	*Salix fragilis*	Hawthorn	*Crataegus monogyna*
Downy Birch	*Betula pubescens*	Hazel	*Corylus avellena,*
English Elm	*Ulmus procera*	Holly	*Ilex aquifolium*
Field Maple	*Acer campestre*	Osier	*Salix viminalis*
Grey Poplar	*Populus x canescens*	Privet	*Ligustrum vulgare*
Horse Chestnut	*Aesculus hippocastanum*	Purging Buckthorn	*Rhamnus catharticus*
Holm Oak	*Quercus ilex*	Spindle	*Euonymus europaeus*
Hornbeam	*Carpinus betulus*	Wayfaring tree	*Viburnum lantana*
Large-leaved Lime	*Tilia platyphyllos*		
Sessile Oak	*Quercus petraea*		

Silver Birch	*Betula pendula*
Small-leaved Lime	*Tilia cordata*
Swedish Whitebeam	*Sorbus intermedia*
Sweet Chestnut	*Castanea sativa*
Sycamore	*Acer pseudoplatanus*
True Service Tree	*Sorbus domestica*
Walnut	*Juglans regia*
Whitebeam	*Sorbus aria*
White Poplar	*Populus alba*
White Willow	*Salix alba*
Yew	*Taxus baccata*
Wych Elm	*Ulmus glabra*
Wild Service Tree	*Sorbus torminalis*
Wild Cherry	*Prunus avium*

All trees should be bare rooted or root balled, and should be transplants, feathered whips, or standard trees depending on the initial effect required of the planting. The use of containerised plants is only advocated where planting out of season is unavoidable. Shrubs should be 450mm (18") transplants.

Before planting, ensure that the ground is free of vegetation, using glyphosate if necessary. Alternatively, plant through black polythene to suppress weeds and reduce moisture loss (this will need to be removed once the trees and shrubs have established) or use biodegradable coyer mats.

New hedges and gaps in defunct hedges more than 1.5ms should be planted in double-staggered rows 30cm apart in groups of five of the same species per metre (Figure 4).

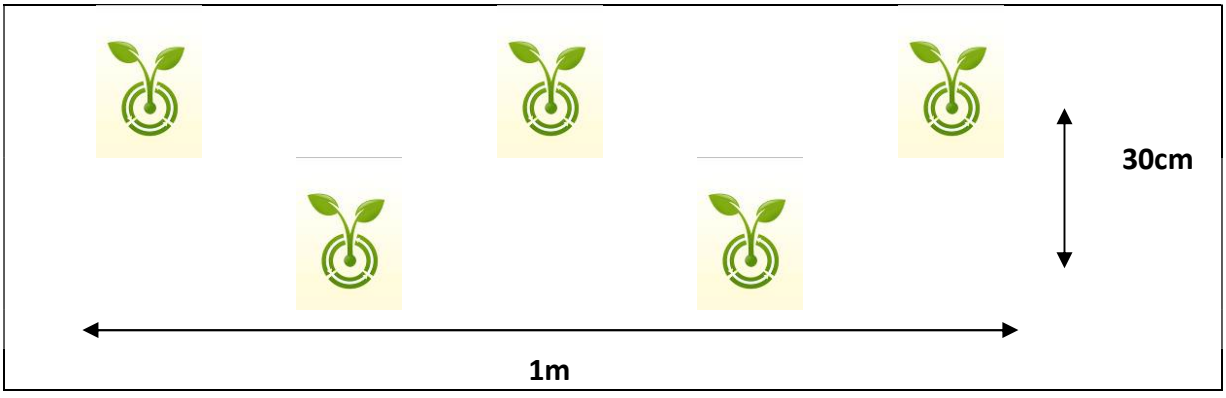


Figure 4: Recommended spacing for a double-staggered row hedge

Hedgerow aftercare

It may be necessary to use plastic tubes, spirals or quills to protect young plants from grazing rabbits or deer and weeding is likely to be required until young trees and shrubs become established. To ensure weed growth is adequately controlled clear competing vegetation, apply mulch and consider use of a suitable granular herbicide around the bases of trees and shrubs to a minimum distance of 0.5 m. Once the plants become established

rotational trimming should aim to ensure that a thick cover is constantly available and berry production is promoted.

Trimming will keep hedgerows in good condition for many years, but occasional restoration work is likely to be necessary to prevent gaps developing or hedges becoming tree lines. Hedgerow restoration can be performed in the winter by one of the following methods.

- Coppicing (cutting the stems at ground level) is the best method of restoration where the hedge is too overgrown to be laid because the stems are too thick.
- Laying (cutting stems part way through and interweaving them along the hedgerow) has a less drastic effect on wildlife and maintains the character of the landscape, but needs skilled labour.

Both coppicing and laying will reduce birds breeding opportunities in the few years immediately after management and should therefore be carried out over several years rather than managing large sections in one year.

Where hedgerow trees are a feature of the hedge, plan to replace mature or dead trees by allowing saplings of native species to be left untouched during trimming. Retain old, dying and dead trees where these are not a hazard, as they support important insect communities and may be used by hole-nesting birds.

Timing
Trees and shrubs may be planted at any time during the dormant season (November to March), provided the ground is not frozen. The best time is early winter, when the ground is warm and some moisture is available. Trimming should be undertaken in January or February to avoid the destruction of bird's nests (present from March to August) and to allow any berry crop to be used by wintering birds (September to December). Avoid trimming all hedges in the same year and instead trim on a two or three year rotation.

Woodland

Retain veteran trees
Veteran trees exhibit habitat features which are particularly important for invertebrates, birds, bats and dormice (Figure 2).

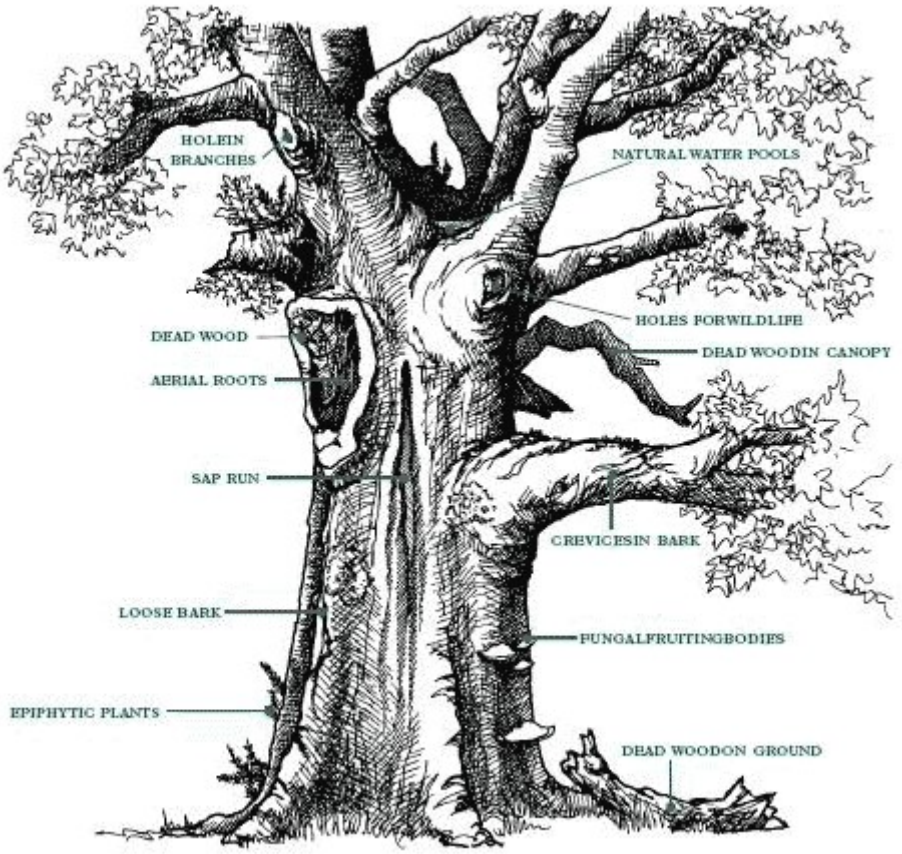


Figure 2: Characteristics of a veteran tree

Veteran characteristics are generally associated with old trees but younger and middle aged specimens may also exhibit signs of premature aging. Retain dead or damaged trees as long as they are safe, especially those with cracks and holes and preserve climbing plants as these provide additional habitat for wildlife and rarely damage veteran trees.

If collapse is inevitable seek specialist consultation and consider pruning using alternative natural fracture and cutting techniques:

- Retrenchment pruning is a technique that can be used to reduce the potential for a fully mature, late mature or ancient tree to collapse or disintegrate under its own weight, as a result of excessive end loading associated with long or weakly attached limbs.
- A coronet cut is a type of natural fracture technique that is particularly intended to mimic jagged edges characteristically seen on broken branches following storm damage or static limb failure. It is carried out as a pruning treatment to a stub or reduced limb to mimic natural breakage. The form of the coronet cut is designed to shape the branch or trunk end-surface to resemble the fracture that might be imagined following a strong storm and is cut to resemble a broken or shattered appearance.

In addition, pruning works affecting trees with deep bark fissures and lamina plates, holes, splits and cracks will require assessment for roosting bats.

Create cavities and decay

Holes, crevices and decay can be initiated in younger trees (Figure 3) and should aim to create a diversity of internal structures suitable for different species:

- Bats such as noctule *Nyctalus noctula* and Daubenton's bat *Myotis daubentonii* will use deep narrow crevices such as those created by woodpeckers. Bats select roosts which provide the optimal conditions to satisfy their needs dependent on their status and environmental factors.
- Birds mostly prefer holes rather than crevices, a variety of sizes will suit a range of species.
- Invertebrates use an almost infinite variety of decay, hole and crevice features. Consider drilling holes of various sizes into trees as well as making larger holes with saws or breaking off branches.

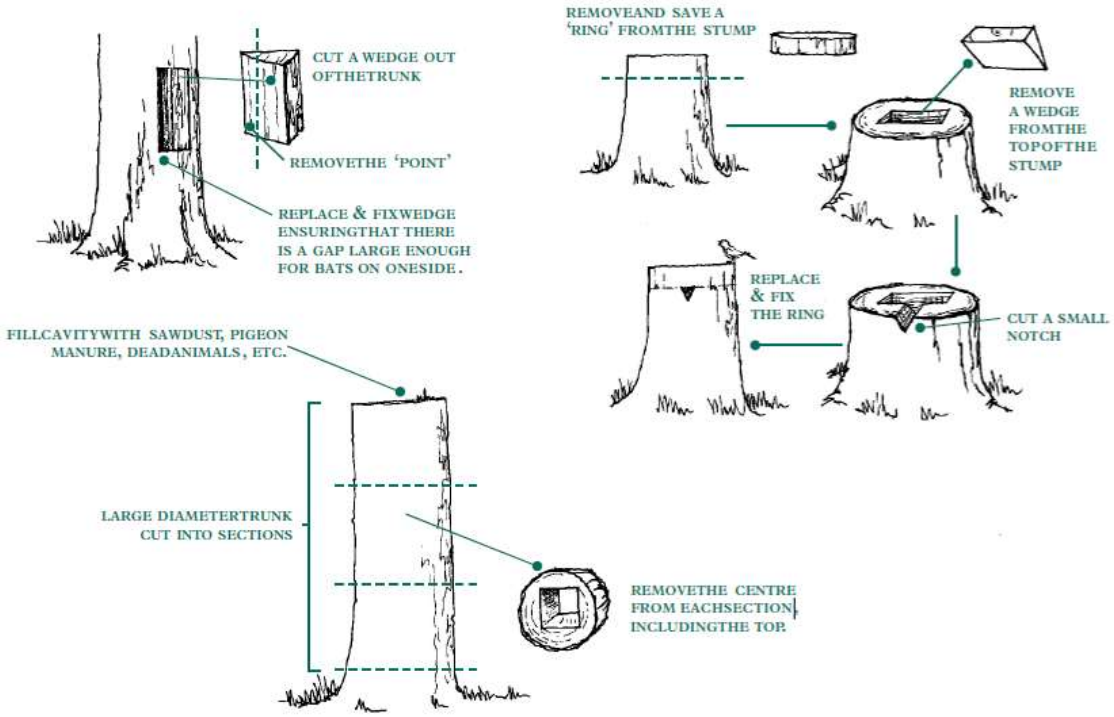


Figure 3: Creating cavities and decay

Convert broadleaved plantations to uneven-aged systems

Gradual, phased removal of the existing canopy should be undertaken to avoid severe disruption to any wildlife present such as bats and dormice, fungi and insects requiring deadwood substrate under shady, moist conditions, as well avoiding damage to young regeneration and ground vegetation.

Coppice

Coppicing involves the periodic cutting of trees allowing regrowth from the stools and resulting in the creation of contiguous woodland areas at different stages of growth.

The first cut should be made at half the eventual coppice age, but in the case of beech *Fagus sylvatica* and birch *Betula pendula*, the earlier the cut, the more likely there will be successful re-growth. New pollards can also be successfully created on young trees up to 15 cm in diameter and up to 15 years old. These are best situated in open positions along the edge of the wood, or along a ride. For some species such as ash *Fraxinus excelsior*, it is advantageous to make the initial cut above the eventual pollard height of 2–3 m, leaving some lower branches intact while new re-growth takes place on the bole, and then finally removing these lower branches, leaving stubs where new shoots will arise.

Timing
The conversion from an even-aged stand to one comprising full range of size classes might take 80 years based on a 10 ha wood undergoing regeneration in small groups of 0.15 ha with regeneration of 10% of the area involving felling seven such groups at eight year intervals. Woods smaller than 10 ha are unlikely to be able to support a full range of size classes, or if this were attempted there would be only very limited patches of each cohort, perhaps too small a habitat for certain species specialising in a particular growth stage.

Coppice is best cut during the dormant winter period; the absence of foliage makes working easier, the bark is less likely to tear from the wood, stool mortality is reduced and new shoots are likely to grow better and suffer less frost damage than shoots formed after a summer cut.

Grassland

Grass margins maintained through the winter harbour over-wintering insects which are an important food source for birds, especially during the breeding season. Infrequently cut or grazed grassland which supports high numbers of field vole provides 'ideal' foraging habitat for barn owls. The grass length should be a minimum of 15 cm in length in order for the voles to thrive and for the population to reach a high enough density that it becomes a viable prey source. Only then will barn owls be able to set up a territory in the area[4].

Grassland margins
Rough grass strips should be at least 2 m wide (ideally 6 m) and it is preferable for blocks of rough grassland to be linked by hedges or grass strips[5].

Management should ensure regular thinning of the grass to stimulate new shoots on which voles survive and ensure that barn owl hunting is not inhibited by sward height or density. However, equally enough time needs to elapse between interference to allow the formation of a dead grass layer as a cover for field voles.

Timing
Cutting should be undertaken in the autumn with the cutting blades set at 10 cm or higher. It should be timed so that it occurs after ground-nesting birds have finished breeding, but early enough in the season that there is time for some regrowth to take place before winter. Where possible, cut rotationally within the landscape (e.g. cut each ditch-side in alternate years). Ideally areas should be topped every second or third year.

Annual or biannual management will also assist in reducing the effects of succession where the margins occur next to hedgerows or woodland.

Wildflower grassland

Grassland flowers provide a valuable nectar source for insects including bees and butterflies, such as meadow brown *Maniola jurtina*, common blue *Polyommatus icarus* and the marsh fritillary *Euphydryas aurinia*. In turn, these attract insectivorous mammals such as horseshoe bats and many declining farmland birds, including skylark *Alauda arvensis* and meadow pipit *Anthus pratensis*.

Wildflower meadows and margins

Wildflower areas are best sited in areas that receive a lot of sunlight and can be established using suitable pollen and nectar-rich seed mixes containing at least four suitable native, locally occurring species such as common knapweed *Centaurea nigra*, yarrow *Achillea millefolium*, and legumes such as red clover *Trifolium pratense*. No single species should make up more than 50% of the mix. A wider diversity of flowers can be established in soils with lower fertility levels and where grassland is being converted, yellow rattle *Rhinanthus minor* can be sown to reduce grass growth and open the sward.

The soils type on the reserve is of the Compton series and is subject to large variations in dampness but inclines towards lengthy periods of waterlogging. The soil is moderately fertile but is also subject to periods of flooding and contamination by pollutants. It is recommended that a general seed mix is used which can tolerate these conditions. The list below identifies species which could be included in such a mix.

Common name	Scientific name	Common name	Scientific name
Yarrow	*Achillea millefolium*	Ribwort Plantain	*Plantago lanceolata*
Common Bent	*Agrostis capillaris*	Hoary Plantain	*Plantago media*
Sweet Vernal-grass	*Anthoxanthum odoratum*	Smooth Meadow-grass	*Poa pratensis*
Betony	*Betonica officinalis*	Tormentil	*Potentilla erecta*
Common Knapweed	*Centaurea nigra*	Salad Burnet	*Poterium sanguisorba* ssp. *sanguisorba*
Greater Knapweed	*Centaurea scabiosa*	Cowslip	*Primula veris*
Wild Carrot	*Daucus carota*	Selfheal	*Prunella vulgaris*
Foxglove	*Digitalis purpurea*	Bulbous Buttercup	*Ranunculus bulbosus*
Red Fescue	*Festuca rubra*	Common Sorrel	*Rumex acetosa*
Lady's Bedstraw	*Galium verum*	Wild Clary	*Salvia verbenaca*
Perforate St John's-wort	*Hypericum perforatum*	Red Campion	*Silene dioica*
Oxeye Daisy	*Leucanthemum vulgare*	White Campion	*Silene latifolia*
Common Bird's-foot-trefoil	*Lotus corniculatus*	Night-flowering Catchfly	*Silene noctiflora*
Musk-mallow	*Malva moschata*	Devil's-bit Scabious	*Succisa pratensis*
Black Medick	*Medicago lupulina*	Goat's-beard	*Tragopogon pratensis*
Field Forget-me-not	*Myosotis arvensis*		

Stock should always be obtained from a grower that specialises in British wild plants (Table 5). The grower should be able to advise on appropriate species, origin, quantities, planting methods and site management. Use a supplier who can source-identify all supplied stock: records of the country and county of wild or native origin should be available and the terms of supply should include a condition that no part of your order should be substituted with stock of alternative species or origin to your specification and that any change must be mutually agreed.

Table 5: Wildflower seed suppliers in the south west

Name and contact details	Wildflower stock details
Bright Seeds 2-4 Manor Farm Barns Burcombe Lane Burcombe, Salisbury Wiltshire SP2 0EJ 01722 744494 chris@davidbright.co.uk **www.brightseeds.co.uk**	Origin: Wiltshire, Hampshire and Dorset. Specialist agricultural seed merchants. Sales of grass, wildflowers, maize seed, stewardship wild bird mixtures and game cover crops. Brush harvest wildflower native seed. Commercial wild flower crops. Supply specialist bespoke wildflower mixtures. Carry out our own harvest cleaning and drying; brush harvester available for hire. Consultancy, botanical surveys, landscape design and advisory service.
Goren Farm Stockland Honiton Devon EX14 9EN 01404 881335 mail@goren.co.uk **www.goren.co.uk**	Origin: South west. Wild flower seed & herb rich hay and haylage. We manage 80 acres of native species rich meadows as a source of local wild-origin seed, especially yellow rattle and meadow grass seed, herb rich hay and haylage. Open farm 3 months of the year with educational visits from schools.
Sue Everett MIEEM 23 Stonewall Terrace Frome Somerset BA11 5AX 07779 204015 suejeverett@hotmail.com www.meadowmaker.me.uk	Origin: Thames Valley (lowland meadows) Cotswolds & Wessex Downs (calcareous grassland; other crop grown). Mixtures of wild-harvested seed; I can also source appropriate seed mixes from reputable suppliers. Seed usually harvested to meet specific needs for field-scale projects. Requirements need to be notified during May for September sowings. Advice on seed specifications and grassland creation available.
Devon Wildflower Seeds Brambles,Laburnum Terrace, Abbotskerswell, Newton Abbott, South Devon TQ12 5PT 01626 364 652 johanna_westgate@hotmail.com	Origin: mainly South Devon. Wild flowers for creating wildlife garden habitats. Also meadow mixtures, cornfield annuals and seed collections for gardens. Brochure available.

Once delivered ensure that seed is kept in a dry, cool, vermin-free store. In the case of large –scale wildflower grassland seeding on bare ground, the recommended sowing rate is 15

kg/ha. If using crop grown mixes, the wildflower component can range from 5–20% by weight; a lower proportion of wild flowers will make the seed substantially cheaper.

Prior to sowing the site will need to be prepared by mechanically slitting or tine harrowing to expose a high percentage of bare ground for the seeds to make contact with soil. Crop-grown seed can be sown using a gravity drill with the seed metered by rollers. Corn drills with the spouts detached, or a rotary strip seeder can work well. Coulters should be set to allow seed to drop on to the soil surface. An inert carrier, such as silver sand, can be used to help distribute processed seed evenly (otherwise the variable seed size can lead to heavy seeds settling). A seed fiddle or seed box can be used to broadcast seed over areas of one hectare or less. Seed should be broadcast or drilled on the soil surface because all wild seed requires light to germinate and burying seed only a few millimetres may significantly reduce germination rates.

Alternatively, wildflower areas can be established using green-hay techniques, which involves obtaining a mid-summer cut from a local wildflower meadow and transferring the cut grass, complete with wildflower seed, to the prepared receptor site. The nearer the donor site, the better, as the crop is more likely to contain local wildflower species and the transportation time is minimised to prevent the crop heating up and becoming infertile. On larger areas it is easier and more efficient to put the hay through a straw chopper and spread as for forage to produce an even, thin layer of green hay and reduce unwanted nutrient deposition from decaying grass. A hectare of green hay taken from a donor site can be spread across three hectares of the receptor site. The cut should then be rolled into the ground using a ribbed “crinkle” or “Cambridge” roller and this can be repeated in early spring to help re-consolidate the seedbed, which may have suffered frost-heave over winter.

Timing
The ideal time to sow wildflower seed is August– September. Sowing is usually done as a one-off operation, but additional hand-sowings can be undertaken in successive years. If the sward closes up, bare patches may need to be created into which the seed is sown by applying herbicide treatment or discing. Green hay sowings should be implemented in July but in dry summers drought conditions can lead to germination and some losses if frost damage occurs. Some wildflowers such as Yellow Rattle *Rhinanthus minor* should always be sown in the autumn and must over-winter in order to germinate the following spring.

Wildflower aftercare
Once the seeds have germinated and the grasses reach a height of about 10cm lightly roll the meadow to firm any plants into the soil then undertake the first cut and repeat every 6-8 weeks during the first year. This will knock back unwanted 'weeds' such as groundsel and chickweed but any thistles and docks should be pulled up. In subsequent years cutting should be undertaken in early spring (March-April) and in autumn (August-September).

Invasive non-native species

Individual landowners have responsibility for dealing with invasive weeds. If this involves chemical control the treatment must be carried out by a contractor with National Proficiency Tests Council certification and an agreement to use herbicides in or near water must be obtained from the EA. Treatment should avoid the flowering period to protect bees and other pollinating insects.

Application of certain types or quantities of herbicide could mean that soil or plant material is classified as 'hazardous waste' if it is taken away from its point of origin. To prevent pollution or threat to human health, arisings must be transferred to the nearest registered carrier or authorised landfill site and accompanied by appropriate documentation (e.g. Hills Waste Solutions, Lower Compton Calne, Wiltshire, SN11 8RB, tel: 01249818075, email: ttorr@hills-group.co.uk, collection service available by prior arrangement) in accordance with the requirements of The Environmental Protection Act 1990 (EPA 1990) section 33 / 34.

Himalayan balsam
Cut the plant, below the lowest node either by hand or machine to prevent regrowth and flowering later in the season. Regular mowing will also control this plant even if the cutting level is above the lowest node, provided the frequency is sufficient to prevent the formation of flowers and seeds.

Small infestations can be controlled by hand pulling as the plant is shallow rooted. Control should be undertaken on a catchment basis, working from the upstream end to prevent seed recolonisation. The seedbank lasts for approximately 18 months, so two years control should eradicate the plant if there is no further infestation from upstream.

Giant hogweed
Spray plants with glyphosate (rate of 61 per ha) when the plants are growing actively but still less than about 1 m high (usually in April and May).The herbicide should be applied as a spot treatment to individual plants, using hand-held equipment and treated areas should be reseeded with grass and other native plants to reduce the rate of recolonisation of the area by seeds of giant hogweed. In addition, control should be undertaken on a catchment basis, working from the upstream end to prevent seed recolonisation.

Regular inspections, preferably in May and August, of treated sites are recommended for at least two years with spot treatments on any surviving plants.

Waterside margins

Linear waterbodies with coarsely vegetated margins act as corridors for movement between habitats and provide feeding opportunities, cover and breeding sites for invertebrates, birds and mammals.

Vertical earthbanks provide nest sites for kingfishers *Alcedo atthis* and sand martins *Riparia riparia* (particularly where a steep drop directly into water offers security from predators such as weasels *Mustela nivalis*). Solitary bees and wasps will also burrow into such banks for breeding sites.

Waterside margin diversification
Management should aim to retain the meandering character and its associated habitats. Trees and shrubs stabilise banks, limit erosion, provide shelter and wildlife habitat. Tree planting should be varied, comprising patches of overhanging trees and shrubs, dense scrub, scattered scrub, stands of tall trees with understory and scattered tall trees.

Retain large, old standing trees with good root-structure to help stabilise banks and provide a source of insect food for fish, leaf litter to feed aquatic invertebrates and fishing posts for kingfishers *Alcedo atthis*.

Planted species should be appropriate to the location, native and preferably of local provenance. Suitable species to consider are: willows *Salix sp*., alder *Alnus glutinosa*, rowan *Sorbus aucuparia*, ash *Fraxinus excelsior* and aspen *Populus tremula*.

Amphibians

The seven UK native amphibian species are found in a range of habitats, their occurrence determined primarily by climate and the structure of vegetation. Habitats such as open woodland, grassland and field edges provide humidity, cover and invertebrate prey (e.g. beetles, woodlice, flies, ants, worms and molluscs) but they also require water for breeding.

Great crested newt survey
Habitats occupied by great crested newts are legally protected but the vast majority (perhaps as many as 80%) remain unrecorded and so many sites are lost despite the presence of great crested newts.

This lack of baseline information is evident within the boundary of Taunton Living Landscape as the Somerset Environmental Records Centre data search returned no records of great created newts despite the presence of numerous waterbodies with surrounding suitable refuges (such as piles of logs or rubble) and forging habitat.

Subject to site conditions and survey requirements, survey methods might include:

- bottle trapping (traps set at 2 m intervals around the perimeter of pond);
- torching (entire margin of pond);
- egg searching;
- netting (15 mins of netting per 50m of shoreline); and
- refuge searching (looking under log piles and other refuges).

All visits should be undertaken during suitable weather conditions (i.e. little/no rain, ambient night time air temperatures >5°C).

Surveying ponds for great crested newts is of vital importance so that records can be passed to regional recorders and record centres, and then relayed to the appropriate authorities. Important sites can be designated as Sites of Special Scientific Interest (SSSI) or County

Wildlife Sites. If records are made available to local authorities, great crested newt habitats can be protected during the strategic planning and development control processes. As sites are identified, their locations and assessment of their management needs can be used to produce targeted plans for local pond restoration and creation. Landowners can be informed of the presence of this species and provided with advice on favourable habitat management.

Timing
The surveys would involve undertaking four visits to establish presence or likely absence between mid-March and mid-June, with at least two of these visits between mid-April and mid-May. Should great crested newts be recorded, a further two visits could be undertaken to establish relative population size. When establishing relative population size, at least three of these visits should be undertaken between mid-April and mid-May.

Badgers

In Britain badgers occupy a large range of habitat types but are most abundant in areas where a mosaic of features are present. Copses, hedgerows and scrub are favoured sett locations as the cover provided allows inconspicuous ingress and egress, and allows cubs to play near the entrance without being visible to potential predators.

A badger's food supply is one of the most important biotic factors influencing habitat selection; population density, group and territory size are all influenced mainly by food availability with the abundance of earthworms *Lumbricus terrestris* being particularly important.

Nearness to habitation does not deter badgers from using an otherwise desirable site, but repeated or drastic interference with a sett can cause badgers to leave if there is an alternative site to go to.

Habitat management
Habitat management for badgers should seek to allow the development of scrub around setts in order to provide cover and limit human disturbance. In the wider area, planting and maintaining fruiting trees and plants, and creating habitats which attract and support invertebrate communities will provide additional sources of food for badger groups.

Bats

The five bat species recorded within the Taunton Living Landscape boundary typically exploit different forging niches, vary in their reliance on linear features for navigation and have specific roosting preferences:

- Common pipistrelle *Pipistrellus pipistrellus*: Exploit a wide range of foraging habitats including those associated with watercourses, woodland, grassland and built-up areas, and commonly commutes along linear structures. They most often roost in small crevices in buildings, trees, stone walls, bridges, barns and also in bat boxes.
- Brown long-eared Bat *Plecotus auritus*: Live and forage around woodland and parkland with old trees and commute along flyways, including hedgerows, treelines,

banks, fences and rides. They frequently roost in older buildings with large uncluttered roof spaces but will also roost in crevices especially during the winter.

- Daubenton's Bat *Myotis daubentonii* : Hunt close to the surface of slow-moving or calm water but will also forage in trees or along woodland rides, especially if these are associated with water. Usually commutes along ditches, hedges, woodland edges and trails and will roost in bridges, especially over water, tree cavities, mill-races, tunnels, mines and cellars.
- Serotine *Eptesicus serotinus*: Forage mainly over pasture, parkland and along woodland edges but may also feed in suburban gardens and around street lamps. Usually commute over linear structures including hedges, waterways and roads and typically roosts in 1930s buildings but occur in much older buildings in cavity walls and structural crevices.
- Whiskered Bat *Myotis mystacinus*: Forage in a wide range of habitats including parkland, woodlands, flowing water and suburban gardens. They are known to commute along vegetation edges, but also use open landscapes. As a crevice dwelling species they are found in a range of buildings, but have a preference for older buildings with stone walls and slate roofs.

Bat activity survey

A bat activity survey should be undertaken to update and expand current species records within Taunton and identify key commuting and foraging areas. This would involve surveyors with bat detection equipment walking planned routes and recording bat ultrasonic calls for subsequent analysis and relevant details of species activity. Sufficient transects should be planned to ensure that all potential habitat areas are sampled within 2-3 hours after sunset and each transect should be visited in spring (April-May), summer (June-July) and autumn (August-September).

Bat boxes

Boxes are most valuable in areas where there is a lack of natural roost features. There are various designs of bat box constructed from a range of materials and suited to different species, purposes and locations.

Wooden boxes

Bats prefer draught-free well insulated boxes where temperature and humidity remain constant. Boxes should be constructed from a rough textured (unplanned), untreated wood, to provide purchase for roosting and include a landing area that leads to an entry slit wide enough to admit bats, but narrow enough to keep out predators (usually 15 – 20 mm) (Figure 6 a.b.) .

The Kent bat box

The Kent bat box is simple to construct, self-cleaning and low maintenance (Figure 6 c.d.e.f). The only critical measurement is the width of the crevices which should be between 15 and 25 mm wide. Other measurements are approximate. The box should be made from untreated rough-sawn timbers approximately 20 mm thick. The box should be rainproof and draught-free and may be fixed in position using brackets, durable bands or wires.

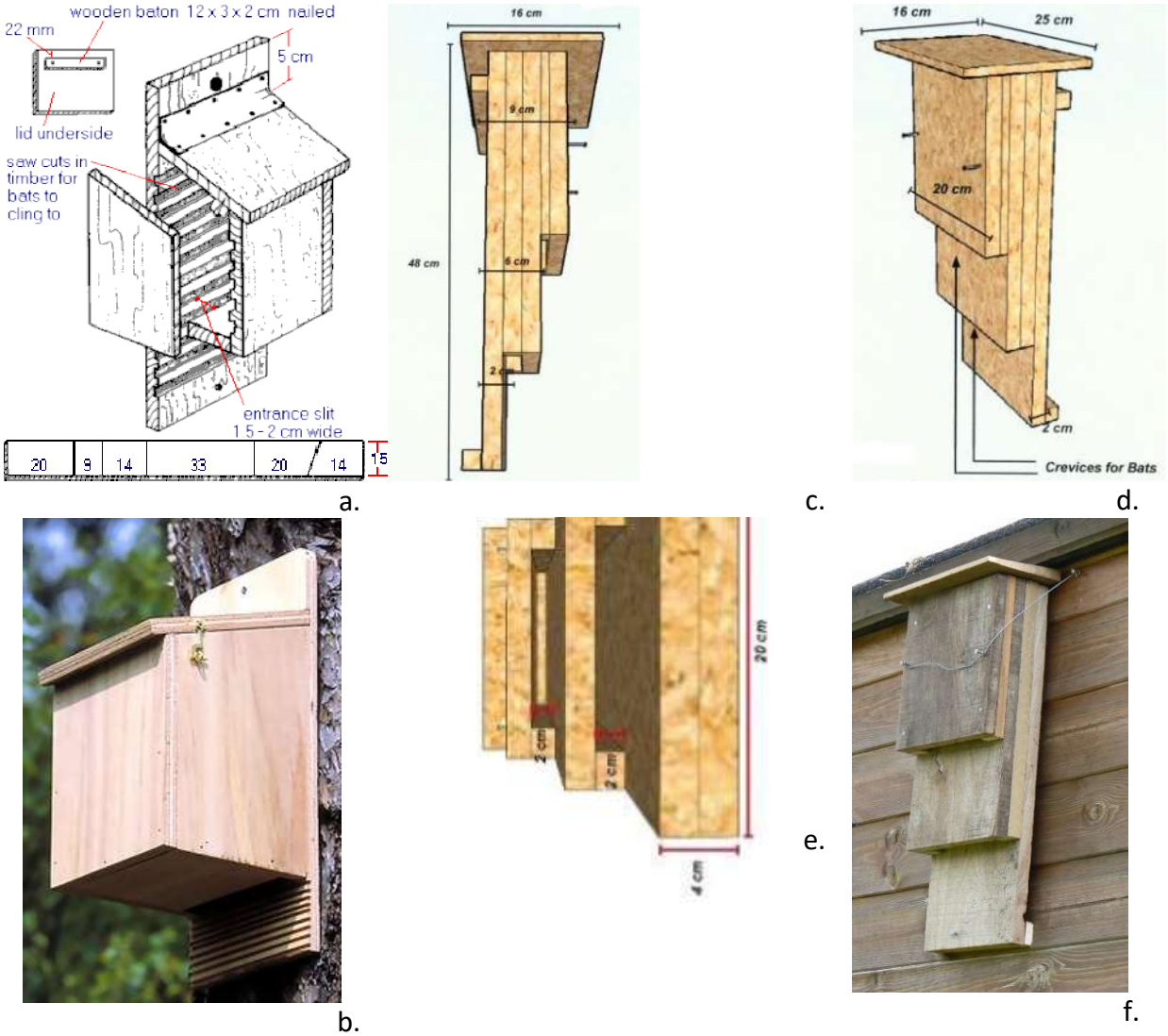


Figure 6: a/b wooden box, c/d/e/f Kent bat box.

Woodcrete boxes

There are two basic types of woodcrete box:

- Cylindrical with an access hole in the front and designed to be hung on tree branches with a wire loop; or
- Brick-shaped, usually with narrow roosting crevices inside and an entry slit at the bottom, designed to be fixed to flat surfaces such as walls of buildings, or into the masonry.

Table 6: Types of woodcrete boxes suitable for trees

Tree box	Description
	**Schwegler 1FF Bat Box** 43cm height x 27cm width x 14cm depth, 120 x 240mm entrance hole, 8.3kg weight. Open at the bottom, allowing droppings to fall out so it does not need cleaning. Suitable for bats which inhabit crevices such as pipistrelle and noctule *Nyctalus noctula* bats
	**Schwegler 2F Bat Box** (General Purpose) 33cm height x 16cm diameter, 4kg weight. Location of access hole means that box is not self-cleaning. Suitable for many situations, and particularly successful for common brown long-eared bat *Plecotus auritus*
	**Schwegler 2FN Bat Box** 36cm height x 16cm diameter, 4.3kg weight The 2FN Bat Box has two entrances - one at the front and one at the rear against the tree. It has a domed roof to form clusters and an increased internal height. This design has proved successful with Noctule *Nyctalus noctula* and Bechstein's *Myotis bechsteinii* bats
	**Schwegler 1FD Bat Box** 36 cm height x 16 cm diameter, 4.8 kg weight. Location of access hole means that box is not self-cleaning. The 1FD is a large general purpose bat box. This model has proved highly effective as a nursing area for small bats such as the common pipistrelle *Pipistrellus pipistrellus*, Nathusius pipistrelle *Pipistrellus nathusii*, Daubenton`s Bat *Myotis daubentonii* and common brown long-eared bat *Plecotus auritus*.

Boxes are more likely to be used if they are located near known foraging areas. Ideally, several boxes should be put up facing in different directions to provide a range of conditions. Boxes should be put as high as possible (at least 4 or 5 m above the ground) sheltered from strong winds and exposed to the sun for part of the day (Figure 7). Some bats use tree lines or hedgerows for navigation and putting boxes near these features may increase encounter rate and occupancy success. However, it is important to clear away surrounding branches to give bats a clear flight path.

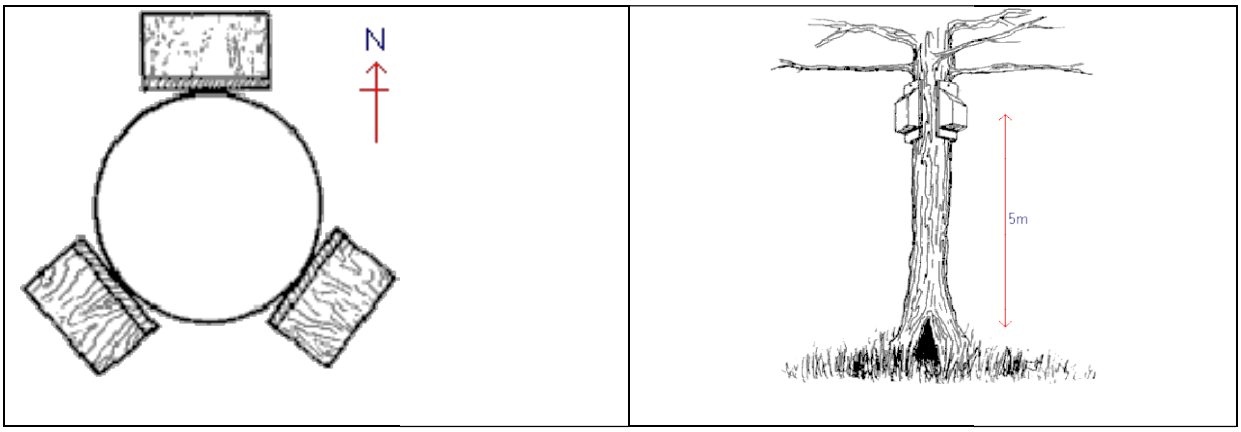


Figure 7. Location of bat boxes

Box maintenance
Once up, a bat box cannot be opened legally without a licence. However, droppings on the landing area, urine stains around the lower parts of the box and chittering noises from inside on warm afternoons and evenings are signs of occupation. It may be several years before boxes have residents however if the box is not occupied within three years, try moving it.

Birds

Nestboxes provide substitutes for the holes found in old trees where there is an availability of food but nowhere for hole-nesting birds to breed. Over 60 species are known to have used nestboxes. Regular residents include blue tit *Cyanistes caeruleus*, great tit *Parus major*, coal tits *Periparus ater*, nuthatches *Sitta europaea*, house sparrows *Passer domesticus*, starlings *Sturnus vulgaris*, spotted flycatchers *Muscicapa striata* and pied flycatchers *Ficedula hypoleuca*, robins *Erithacus rubecula*, house martins *Delichon urbica*, kestrels *Falco tinnunculus*, tawny owls *Strix aluco* and barn owls *Tyto alba*. Much depends on the type of the box, where it is located, and on its surroundings.

Small hole and open-fronted nestboxes
A small hole nestbox can be made from one 48 inch piece of timber, 6 inches wide, and 0.75 inch thick (Figure 7). The roof should be hinged, for ease of cleaning out, either by a non-ferrous hinge and screws or by a rubber strip. The box may be screwed or nailed together, and small drainage holes should be drilled in the floor. An entrance hole of 28 millimetres in diameter will admit blue tit *Cyanistes caeruleus*, great tit *Parus major*, coal tit *Periparus ater*, tree sparrow *Passer montanus* and pied flycatcher *Ficedula hypoleuca*; whereas a slightly larger hole of 32 millimetres in diameter will also attract house sparrow *Passer domesticus*, nuthatch *Sitta europaea* and lesser spotted woodpecker *Dendrocopos Minor* (if squirrels are a serious threat, fix a metal plate around the entrance, so that it cannot be enlarged).

These boxes need to be 2-4m high, sheltered by vegetation but with a clear outlook. If there is no natural shelter, mount the nestboxes between north and east, to avoid direct sunlight and the heaviest rain. Tilt the box forward slightly so that the roof deflects rain from the entrance and interior. Attach boxes with a nylon bolt or with plastic covered wire around

the trunk or branch to avoid damaging trees leaving sufficient excess for future girth expansion and check the fixing every two or three years.

Small open-fronted nestboxes suitable for robins *Erithacus rubecula* and wrens *Troglodytes troglodytes* are of similar size and construction to that for a small-hole nestbox, except that the front will be a piece of wood 3.5 x 6 inches and it is not necessary to hinge the roof as the box can be cleaned through the entrance hole. These boxes need to be low down, below 2m and well hidden in vegetation.

Large-hole Nestboxes
Large-hole nesting bird boxes (Figure 8) are suitable for stock dove *Columba oenas*, jackdaw *Corvus monedula*, starling *Sturnus vulgaris*, green woodpecker *Picus viridis* and great spotted woodpecker *Dendrocopos major*.

The box should have a stout batten (approximately 24 inches long, or 3 x 1 inches timber) screwed firmly to the back of nestbox for mounting to a tree as high as possible in a secluded place. Drainage holes should be drilled in the floor. The design shows a rectangular entrance hole 6 x 4 inches, which is acceptable for stock dove *Columba oenas*, jackdaw *Corvus monedula* and starling *Sturnus vulgaris*. However the size of the front hole should be 50 millimetres for great spotted woodpecker *Dendrocopos major* and 60 millimetres for green woodpeckers *Picus viridis*.

For all woodpeckers, the box should be packed with a block of balsa wood which they can excavate to make their nest and the roof should be hinged, preferably with a strong brass hinge, to allow replacement blocks to be inserted. Woodpecker boxes need to be 3-5m high on a tree trunk with a clear flight path and away from disturbance.

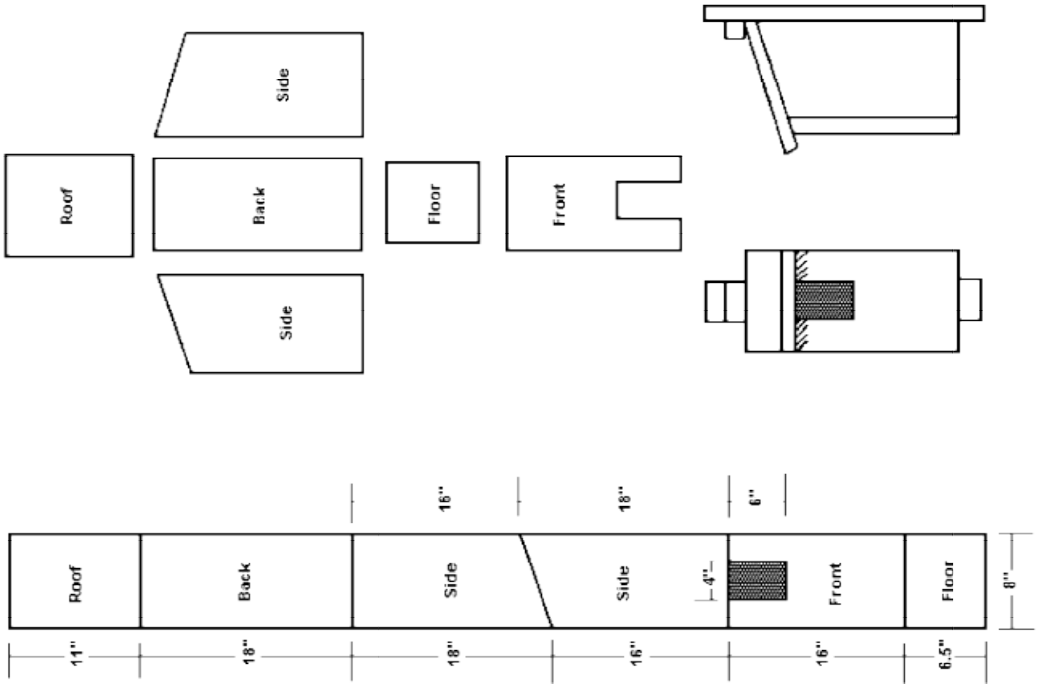


Figure 7: Small hole and open-fronted nestbox design

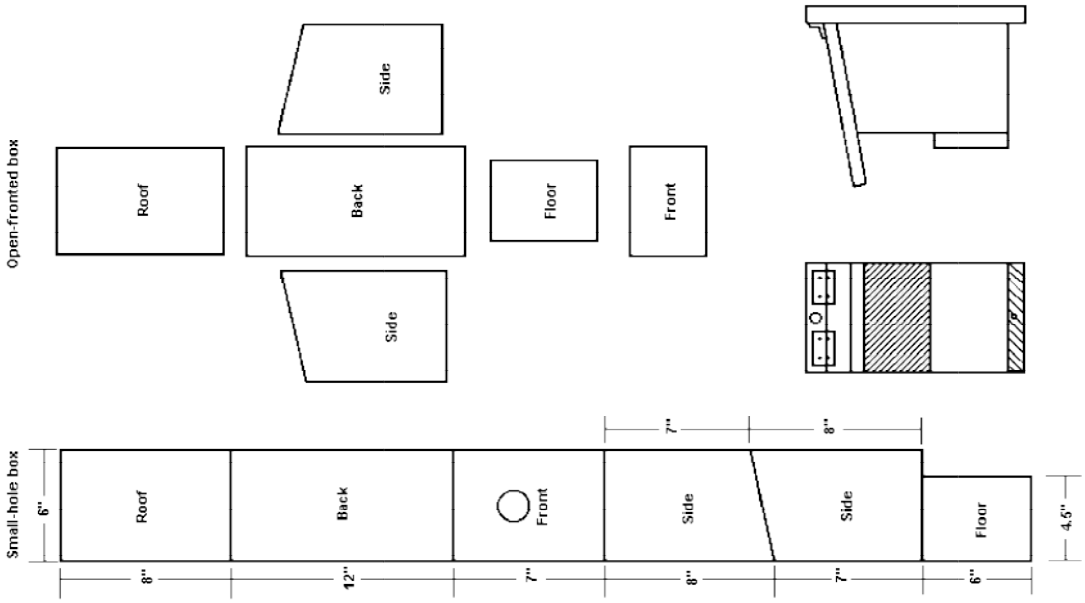


Figure 8: Large-hole nestbox design

Barn owl nestboxes

Barn owl boxes (Figure 10) should be erected in pairs, within 500 m of each other and at a density of about one 'box pair' per km2. It is strongly advised to mount boxes more than 1 km away from major roads to reduce the likelihood of barn owls colliding with cars. Suitable trees are large isolated trees, ideally more than 100 m from any wooded area. Mount the

box at a height that is safe from human interference, at 3 m or higher but accessible for clearing-out of nest debris. The box entrance hole needs to be visible to a passing owl.

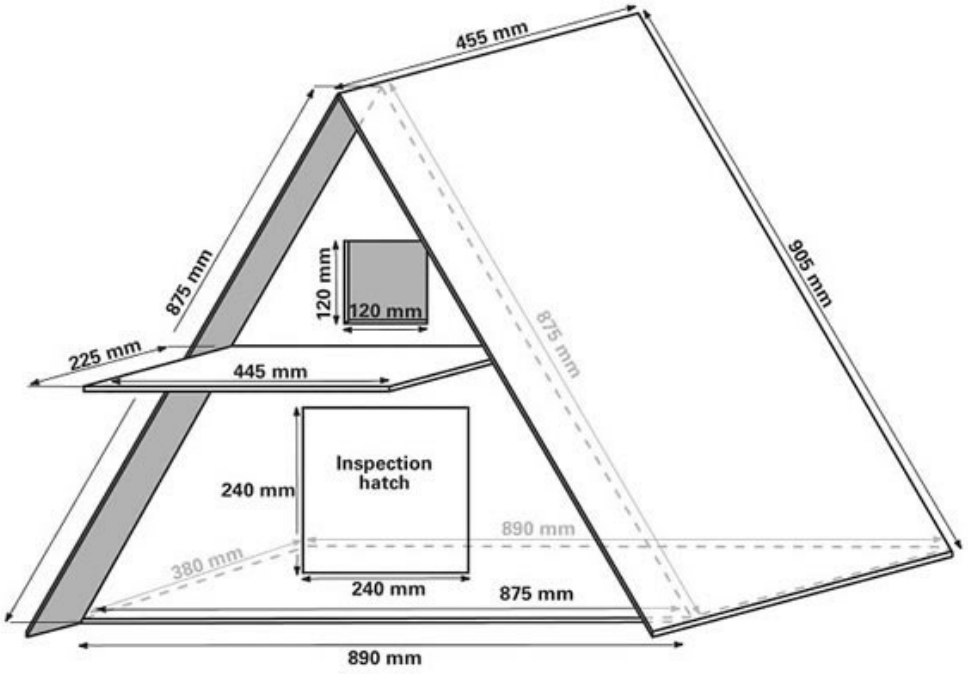


Figure 10: Barn owl nestbox design

Timing
Nestboxes are best put up from August to October when birds will enter, looking for a suitable place to roost or feed. They often use the same boxes for nesting the following spring. Tits will not seriously investigate nesting sites until February or March.

Nestbox aftercare
After the end of each breeding season, all nest boxes should be taken down and the old nesting materials removed, and the box should be scalded with boiling water to kill any parasites. Do not use insecticides or flea-powders. Annual cleaning should be carried out in October or November with boxes left up throughout winter as a roosting site for birds in bad weather.

Boxes used by breeding barn owls *Tyto alba* only will need clearing out every two or three years however if jackdaws *Corvus monedula* use the box it must be cleaned out every year (wear gloves and a dust mask).

Under the terms of the "Wildlife and Countryside Act 1981", if unhatched eggs are found in the box, they can only legally be removed from October to January inclusive, and they must be destroyed as it is illegal to keep them.