

BACKWELL ENVIRONMENT TRUST



MANAGEMENT PLAN 2018 - 2028



Jubilee Stone Wood
Badgers Wood

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VERSION CONTROL

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- Amendments:
- Section 8: Dormouse breeding season: changed from mid-August to September
 - Tables 3 & 4: Bird boxes: winter cleaning of boxes added

1 INTRODUCTION

1.1 Purpose of the Plan

This plan has been prepared in order to identify the specific objectives, priorities and aspirations in relation to the current and future management of Backwell Environment Trust's (BET) two nature reserves over the next 10 years.

Management plans are a core element of nature reserve and woodland management work. This plan has been prepared in order to provide a framework within which all future tasks can be carried out and to enable any person to understand how and why decisions are taken. The plan will also ensure members and visitors will be engaged with the reserves' ongoing management.

Accurately planning woodland activities for up to ten years in advance is clearly subject to many variables and so this plan has been designed to be a 'working document' and may therefore be added to or amended as necessary during the timeframe of this document.

This is the second management plan that has been written for Jubilee Stone Wood and the first for Badgers Wood Nature Reserve. This plan covers the time period 2018 – 2028.

1.2 Management Plan Structure

This plan describes the geology, history, archaeology, flora and fauna of both nature reserves as well as their past woodland management. It presents a detailed strategy for the reserves and documents the tasks to be undertaken over the next ten years to achieve the strategic goals.

To ensure this management plan aims for the highest standards in woodland management, BET commissioned external wildlife consultants to produce the strategy section of this document (Section 8). The future programme of tasks on the nature reserves (Table 2 – Table 10) has been developed with full adherence to this strategy, and has been approved by the external consultancy.

2 SITE DESCRIPTION

2.1 Location and Access

Backwell Environment Trust's two nature reserves are situated on the northern edge of Broadfield Down on the top of Backwell Hill, to the south of the village of Backwell. The central grid reference for the site is ST 4961 and the land rises to a maximum altitude of just over 155 metres. The Trust currently has two reserves:

Jubilee Stone Wood (10 acres / 4.05 hectares)

Badgers Wood (12 acres / 4.86 hectares)

Although both reserves are situated within a rural location, approximately half a million people live within a 10 mile radius of the site, with the city of Bristol and the towns of Nailsea and Clevedon being large centres of population.

There is pedestrian access to both sites from Church Town, Backwell, on their northern side and also from Cheston Combe Road, Backwell, on their southern side. Jubilee Stone Wood has a bridleway running through its entire length whilst Badgers Wood has a public footpath.

BET has also created numerous permissive paths throughout both reserves (in total, approximately 1km of new paths have been created) to enable visitors to reach areas of the woodlands that were previously inaccessible. Jubilee Stone Wood has approximately 300 metres of wheelchair-friendly trails whilst Badgers Wood has approximately 100 metres. Both trails are on level, stabilised ground, have parking facilities at one end and both finish at spectacular viewpoints.

2.2 Relation to other Green Infrastructure (Figure 1)

Both of BET's nature reserves (Figure 2) are located on the ridge known as Broadfield Down which has been quarried for its Carboniferous limestone over many years. The quarry to the west of Badgers Wood ceased operation in 1999 and has since developed into an important wildlife site with peregrine falcons regularly nesting on its sheer cliffs. Further west are the extensive woodlands of Brockley Wood and Kings Wood, close to the village of Congresbury. To the east, there is a mixture of woodlands and agricultural fields with one active and one abandoned quarry.

2.3 Ownership

Backwell Environment Trust is the sole owner of both Jubilee Stone Wood and Badgers Wood nature reserves totalling 22 acres in area. The purchase of both sites was facilitated by applications to numerous grant bodies as well as generous support from Backwell Parish Council and the citizens of the village of Backwell and beyond.

Backwell Environment Trust was formed in 2004 and is a registered charity (number 1109406).

The Trust's constitutional objectives are:

- To promote for the benefit of the public the conservation, protection and improvement of the physical and natural environment and the understanding of past and present human activity and its impact on the environment.

- To advance the education of the public in the conservation, protection, improvement and history of the physical and natural environment.

2.4 Land Acquisition

BET is receptive to acquiring suitable new land to manage as nature reserves providing suitable funds could be raised and any health and safety implications overcome. Land adjacent to our existing holdings would be especially valuable if it could be utilised as a link to the surrounding green infrastructure.

2.5 Overview of the Reserves

Jubilee Stone Wood was bought in 2004 and was named after the obelisk which was erected to commemorate the 60th year of Queen Victoria's reign. The obelisk is situated within the reserve at the highest point of the northwest boundary, with views across the valley to Wraxall, Tyntesfield, Cadbury Camp ridge and the Welsh hills beyond.

The reserve is a narrow strip of mainly semi-natural broadleaved woodland running along the north side of Cheston Combe. Historically, the land was predominantly calcareous grassland and was grazed until the 1960s, since when it largely reverted to mainly ash and hawthorn scrub. Patches of the limestone grassland remained, notably around the Jubilee Stone, with areas of unimproved, reseeded and ranker limestone grassland and neutral grassland. Additional grassland and glades have been restored, now making up approximately 10% of the reserve, and are developing into beautiful wildflower meadows supporting a wide range of insects and pollinators. During this restoration, a patch of acidic limestone heath was identified which is a very unusual habitat for areas with an underlying limestone bedrock. This habitat is now being protected from scrub encroachment.

Badgers Wood was purchased in 2009 and, it too, is a narrow strip of land lying on the opposite side of Cheston Combe to Jubilee Stone Wood with quite different characteristics. The lower section is dominated by a limestone ridge; the woodland here can almost certainly be classified as ancient woodland. The upper section borders a disused quarry and offers views across Backwell to the Bristol Channel and beyond. The upper slopes were previously grassland and, again, became inundated with scrub after grazing ceased. We have restored several areas of linked wildflower meadows, now making up approximately 7.5% of the reserve.

Over 90% of the combined reserves' area comprises old and new woodland. The majority of the new woodland is less than 50 years old with a high proportion of ash and hawthorn. The woodland is now actively managed to maintain and improve the diverse wildlife habitats, whilst controlling non-native species. Across the two reserves, we have now (2018) recorded over 750 species, 327 of which are plants, which is an exceptional number for limestone grassland and woodland in this geographic area.

Of special note is the Hazel dormouse which is a protected species. With around 40 dormouse nest boxes (2018), and high occupancy numbers, our reserves have become a nationally important site for this rare mammal.

A summary of all the species recorded on both reserves from 2005 to 2018 is shown in Table 11. The full species list can be found on the BET website under 'nature and wildlife or use the link: [BET Nature and Wildlife](#).

3 GEOLOGY

The Carboniferous limestone of Backwell Hill was formed by the deposition of calcium carbonate from the remains of marine animals falling to the floor of a warm, shallow lagoon about 350 million years ago when the British Isles straddled the equator. The hill is divided by Cheston Combe which is one of a series of steep-sided dry valleys orientated south-east to north-west starting with Goblin Combe in the west and ending with Bourton Combe in the east. All of these valleys are thought to have been carved out by large quantities of water, probably from melting ice, flowing over and through the limestone in earlier geological time periods.

Jubilee Stone Wood nature reserve contains a linear seam of galena (lead sulphide) which has been mined in recent history. Numerous examples of the open cast workings together with the remains of subterranean mineshafts are still clearly visible in the woodlands today. Deposits of yellow ochre (a hydrated form of iron oxide) have also been unearthed on the reserve. Although this mineral has been identified as being mined in the locality in antiquity, we have not discovered any evidence that this mineral was extracted from the reserve site.

Other minerals such as calamine (zinc carbonate), malachite (copper carbonate) and barytes (barium sulphate) also occur in lesser quantities.

The reserves also contain quartz nodules known as 'potato stones' which are either spherical or ovoid in shape with a somewhat fanciful resemblance to the humble potato. They are quite widespread in the locality and vary in size from less than 1cm to a maximum of about 20cms in diameter. When sectioned, potato stones reveal their amazing internal structure which is frequently made up of convoluted, coloured bands originating from a complex mixture of red iron oxides.

Badgers Wood nature reserve contains a rare example of a Carboniferous limestone pavement dating back approximately 328 – 334 million years.



Limestone pavements are a very rare occurrence in this part of the UK and the Badgers Wood pavement is by far the largest known expanse in all of southern England.

4 HISTORY

4.1 Rabbit Warren and Cottage

The warren, in what are now Jubilee Stone Wood and Badgers Wood, was granted to Sir Richard de Rodney on the 10th June 1318 by order of King Edward II. References from a survey of the Manor of Backwell in 1709 record that the warren, at that time, covered an area of 3 furlongs by 1½ furlongs (600 x 300 metres) and would consequently have had the potential to produce many thousands of rabbits per year. The warren appears to have been in continuous use until about 1812 when the introduction of the Enclosure Act divided the area of the warren into fields which were subsequently allocated to Court Farm, Backwell. After this date, the fields were most likely used for other agricultural purposes and the warren was almost certainly abandoned commercially.

It is believed that rabbits originally came from south-western Europe so, to ensure they would thrive in our cooler climate, artificial warrens were built consisting of low, flat-topped mounds varying in size from a few metres to over a kilometre in length. These mounds were often referred to as 'pillow mounds' and were once quite a common sight in the English countryside. Warreners were appointed to protect and harvest the rabbits and it was not unusual for the Lord of the Manor to allocate them suitable accommodation as part of their position.

The first written references to the warrener's cottage date from the 1780s when the building was repaired after a severe storm. The ruins visible today show that the cottage would have originally covered an area of 45 square metres with the adjacent walled garden (located to the left of the cottage when viewed from the path) about 1200 square metres.



The warreners who cared for, harvested and processed the rabbits were often provided with purpose-built accommodation. This was often of a higher standard than was usual for the period and illustrates the importance of rabbits at the time. The cottage would have been a two-storey structure built of limestone blocks extracted from the local bedrock and made watertight probably with a thatched roof, later to be replaced by a stone or tile roof. The warrener would have used the ground floor as a workshop to process the rabbits whilst using the upper storey as his living accommodation. When not working, this arrangement would have enabled him to keep a watchful eye out for both predators and poachers approaching the warren. The large adjacent garden would have also allowed the warrener to grow his own produce enabling him to be relatively self-sufficient.

After the warren was abandoned, the records show the cottage was still lived in up until 1843; however, it eventually fell derelict sometime between 1843 and 1882.

During the spring of 2008, the cottage outline was surveyed and in the spring of 2018, the soil was removed from the outside of the cottage, both with the advice of the retired County Archaeologist.

4.2 Mining

The geology of BET's nature reserves is dominated by Carboniferous limestone which was laid down some 300 to 350 million years ago in a warm, shallow sea from the remains of countless marine animals. One hundred and fifty million years later during the Jurassic Period, mineral-rich water began to be forced up from the hot depths of the earth through the many faults and fissures in the limestone which today has resulted in the accumulation of numerous metal ores in the bedrock.

Whilst both copper, barium and iron ores are present in the Carboniferous limestone of Backwell Hill, the most abundant minerals are 'galena' (lead sulphide) and 'calamine' (zinc carbonate). Historical records confirm that both these metals were being mined here during the 17th century and possibly even earlier as was the case at nearby Goblin Combe. Zinc combined with copper is transformed into brass which was a highly prized alloy during the period and was much in demand. During this century, most of the calamine extracted from the west of England originated from this area which, in turn, led to the city of Bristol becoming a major centre for the industry.

The mining of lead in the British Isles goes back to prehistoric times and was one of the factors that attracted the Romans to Britain in 43AD. Lead ore or 'galena' usually occurs in narrow, vertically orientated seams. When the miners located these outcrops at or near the surface they would have dug simple, open cast circular pits or grooves to extract the ore. Jubilee Stone Wood has numerous examples of these pits. Some of the deposits of lead however were found to descend deeper into the bedrock and the miners would have ultimately reached a point where it would become too difficult to remove the rock by shovel, whilst the steep walls of the pit would have become increasingly unstable. When this situation developed, the miners would have dug vertically down through the limestone bedrock opening up a small shaft and ultimately a narrow, bell-shaped chamber underground. The two circular mounds in lower Jubilee Stone Wood are thought to be examples of these narrow shafts covered with a layer of waste material from the mining process.

4.3 Lime Kiln

The lime kiln in Jubilee Stone Wood was constructed sometime between 1843 and 1884 to convert limestone (calcium carbonate) to 'quicklime' or 'lime' (calcium oxide). This material had many uses ranging from the production of lime mortar and lime wash for buildings, to its use in agriculture as a soil improver.

The kiln has been built from locally extracted, limestone blocks and has been deliberately set into the sloping hillside. This arrangement has the advantages of saving on construction costs whilst also assisting in its ease of operation by being able to load from the top and unload from the bottom. It also ensured the kiln was aligned with the prevailing south-westerly winds which would have helped fan the fire and speed up the conversion process.



The internal bowl of the kiln was lined with Pennant sandstone extracted from around Nailsea. Whenever kilns were constructed from

limestone blocks, it was always necessary to physically separate the limestone used in the main body of the kiln with the limestone used for the production of lime, otherwise it too would be converted to quicklime during the lengthy firing process.

Directly in front of the kiln are the remains of an open-sided rectangular enclosure which may have served as a storage area or alternatively used as a sheltered loading point for the extracted quicklime.

Towards the end of the 19th century, improvements in transport enabled larger industrial kilns to mass-produce lime at comparatively lower prices, whilst the use of cement in the construction industry was becoming increasingly popular.

Historical evidence from old maps indicates that Jubilee Stone Wood's lime kiln fell into disuse sometime between 1884 and 1902. The adjacent structure probably collapsed soon after the kiln was abandoned which has clearly helped to preserve the kiln in the excellent condition we find it today.

The manufacture of quicklime was a time-consuming, dangerous and labour-intensive process. Sufficient limestone and fuel (probably coal and/or wood) would have to be collected and transported, loaded into the kiln in layers and set alight. The limestone was heated in the kiln at temperatures of up to 1000°C for around 3 to 4 days.

The raw materials needed for the process were all available locally. Wood (or charcoal) could be easily sourced from nearby woodlands and coal could be hauled up Cheston Combe from the pits around Backwell and Nailsea. Limestone was almost certainly mined from the surrounding area and the woodland has several large, square-shaped pits where limestone has clearly been extracted.

4.4 The Jubilee Stone

The woodland takes its name from The Jubilee Stone, a large granite plinth and obelisk, erected to commemorate the 60th year of Queen Victoria's reign in 1897. Since then, subsequent royal anniversaries have been added to the obelisk.

4.5 Stone Walls

Both reserves contain examples of both dry stone and lime-mortared walls depicting the ancient field boundaries. They were probably constructed sometime in the early 1800s after the introduction of the Enclosure Act.

4.6 Adjacent Archaeology

4.6.1 Backwell Cave

Backwell Cave is located in the hillside at the bottom end of Cheston Combe, on a small strip of land between Badgers Wood and the abandoned Coles Quarry. Today it is more of a recess than a cave but it was of great importance to the people who lived nearby over 5,000 years ago.

Backwell Cave was relatively unknown until 1936, when quarry owner Joseph Coles asked two quarrymen to clear out the debris of stones and red clay inside it. When pieces of bone appeared in the soil, the digging was halted and in 1937, an excavation was carried out by E. K. Tratman. Remains of 18-30 individuals, men, women and 3 children were uncovered, their bodies

apparently buried on their left sides, in the flexed position. This could explain why many right side bones were missing, as the bodies were disturbed when further burials were placed over them at a later date. The surviving bones are less than complete skeletons and only two complete skulls have ever been found, one of which had a large healed fracture, probably by an axe causing a severe head or brain injury.

Animal bones recovered were also fragmentary with sheep and oxen being the most plentiful. Artefacts included a rare sheep or goat bone, double-pointed prong or fork, a leaf-shaped flint arrowhead and a broken flint knife. Two spindle whorls for spinning wool, one made of liassic limestone was lathe-turned and the other was of pottery, flat, disc-shaped and both were possibly Roman. Amongst the few other artefacts was the lip of a wheel-turned black pot and several early Iron Age fragments.



Recently, radiocarbon dating has been carried out on two of the surviving bone vertebrae revealing that they are from the Neolithic Period (New Stone Age) and are therefore over 5,000 years old - much earlier than previously thought.

4.6.2 Bronze Age Barrows

There is a Bronze Age cemetery in the agricultural field adjacent to the Jubilee Stone with possibly four to six burial mounds dating back some 2,500 to 4,000 years. They date from the middle to late Bronze Age when the usual practice was for the dead to be cremated and buried either individually or as part of a family group. The ashes were then placed in specially-made urns and set upright in a pit in the centre of an earth or rubble mound, sometimes surrounded by a ditch.

Barrows were usually placed on the false crest of a hillside and in close proximity to the settlement. To date, no traces have been found of Bronze Age settlements in the Backwell area.

The largest mound in the field is 9.2 metres (30 feet) in diameter and was excavated by the Reverend George S. Masters in 1898.

Very little can be seen of the barrows today, apart from some slightly elevated surfaces and the occasional limestone block breaking through the topsoil. Most of the stones were removed to allow deep ploughing by tractors in the field after the Second World War.

In 2011, both resistivity and magnetometry geophysics were carried out on several of the barrows to determine if any features still remained beneath the surface of the soil. These surveys uncovered two previously unknown barrows and concluded that all the main burial sites may well still be intact.

4.7 Historical Landscape

2018 - 1960s: Predominately Woodland

Most of the woodland we see today only dates back to the mid 1960s. During the winter of 1961/62 a barbed wire fence was erected between what is now Jubilee Stone Wood and the large adjacent pasture field. The fence excluded grazing animals which then allowed tree seedlings

(mainly ash and hawthorn) to quickly colonise the meadows, eventually creating too much shade for the wildflowers to continue.

1960s - 1812: Pasture

Maps drawn up in 1956, c1884 and 1840, also show that the entire hillside was described as 'pasture', except between about 1890 and the early 1940s, when a large part of the field next to Jubilee Stone Wood was used as a golf course. Figure 3 is an aerial picture taken in 1946 which shows large areas of open pasture with very few trees present.

1812 - 1318: Rabbit Warren (Pasture)

The warren on Backwell Hill (covering sections of both Jubilee Stone and Badgers Wood reserves) was established in 1318 and was in operation for almost 500 years. It was fairly large in size, measuring approximately 600 x 300 metres – large enough in fact to be recorded on one of the first Ordnance Survey maps in our region.

As rabbits are predominately grass grazers, we can be confident that during this period, the area of the warren was meadow.

1318 – 800BC

During the two thousand years prior to the 1300s, very little evidence exists as to whether Backwell Hill was covered with trees or meadows.

800BC – 2500BC: The Bronze Age

The large field next to Jubilee Stone Wood still has the remains of four to six Bronze Age barrows which were usually constructed on the false crest of a hillside. This was to ensure they could be viewed not only by the people living below them, but also by people living some distance away, so it is a fair assumption that during this time period between 2,500 and 4,000 years ago, the land was probably open grassland.

5.1 Woodland Management

Commencing in October 2006 in Jubilee Stone Wood, the first of a series of woodland management projects were undertaken with the aim of transforming what was once neglected, species-poor woodlands into two thriving nature reserves rich in plant and animal life.

Tasks are undertaken using volunteers throughout the year and typically comprise:

March – August: path maintenance, archaeological restoration, dry stone walling, bracken removal.

August – November: Hand scything of the wildflower meadows.

November – March: Coppicing, scrub control, hedge laying.

The eight key objectives of BET's woodland management programme are:

- Habitat creation and restoration to support rare and endangered species
- Reducing the incidence of non-native species
- Reducing the dominance of native invasive species
- Re-establishing habitats lost to scrub
- Restoring wildflower meadows and linking woodland glades
- Creation of new habitats
- Preservation and restoration of the archaeological features
- Improving access to the reserves

5.1.1 Habitat Creation to Support Rare and Endangered Species

Example: Hazel Dormouse

The hazel dormouse is a nocturnal animal that lives mainly in open deciduous woodlands and scrub. Except for hibernation, they rarely descend to the ground and spend most of their active



lives up in the tree canopy. They feed on a wide variety of arboreal food throughout the year, including flowers (nectar and pollen), fruits (berries and nuts) and insects (aphids and caterpillars).

The ideal habitat for dormice would contain the wide variety of foods they require with an open, high canopy of trees allowing ample light to reach an understorey of shrubs and bramble.

Since dormice were first recorded on the reserves, we have been actively managing the woodlands to improve the habitat for this legally-protected species, principally by thinning out high canopy trees which were casting too much shade and inhibiting the growth of the understorey layers.

Example: Damp, Limestone Heath

The overlying soil pH on both reserves is generally within the range 6.5 to 7.5 (neutral pH). However, one section of Jubilee Stone Wood exhibits a soil pH of around 5.5 which has allowed a 'limestone heath' flora to develop which includes acid-loving plants such as common gorse, bell heather and ling, tormentil, betony and marsh thistle. Acidic soils overlying a limestone bedrock are a fairly rare occurrence but damp, acid soils on limestone are extremely rare.



Since this area was first identified, the meadow has been incrementally reclaimed over a number of years from the encroaching scrub to restore this unique habitat.

5.1.2 Reducing the Incidence of Non-native Species

Example: Box Honeysuckle (*Lonicera nitida*)

Box (or Wilson's) honeysuckle, a garden escape commonly used as a hedging plant, dominated a large area in the south-east corner of Jubilee Stone Wood and was present in a single large section in Badgers Wood. Initially our approach was to dig out as much of the root system as possible, but this technique proved to be only partially successful as the plant quickly regenerated from any remaining sections of root left in the ground. During the spring and summer of 2007, the plants were cut off close to the ground and the stumps treated with a low impact, systemic herbicide. This approach has proved to be much more successful and its incidence has now been much reduced in Jubilee Stone Wood.

However in Badgers Wood, because there is presently less natural scrub on this reserve, we have taken a more pragmatic approach and retained the large section of *Lonicera* as it offers superb nesting opportunities for songbirds and possibly dormice.

Example: Turkey Oak (*Quercus cerris*)

Turkey oaks were introduced into England in 1735 from southern Europe and have spread rapidly, especially on the well-drained, dry soils commonly found overlying limestone. They have grown particularly well on the reserves producing a dense shade that has restricted the growth of other native trees and plants. They have also become the preferred host species for the knopper gall wasp which can distort the English oak's acorns. Where it is safe to do so, turkey oaks have either been felled or ring-barked/treated with systemic herbicide so they can be retained as standing dead wood. As these trees slowly decay, they will provide a valuable habitat that should benefit a wide range of wildlife including fungi, insects, birds and bats.

There are also other non-native plant species present just outside both reserves such as the Spanish bluebell and Winter heliotrope. BET's policy is to remove these species if found on the reserves before they are able to colonise the woodlands.

5.1.3 Reducing the Dominance of Native Invasive Species

Example: Bracken

Large areas of grassland on both reserves were initially inundated with dense glades of bracken, often found growing up to two metres high. Bracken is a native fern but since the land was fenced off to livestock, it had been allowed to grow unchecked and consequently it has had a highly detrimental effect on the survival of almost all grassland plants attempting to grow beneath its dense shade. Our aim therefore was to remove approximately 95% of the bracken, preserving the remainder around the edges of glades to serve as cover for birds and insects. Starting in spring 2007 and continuing up to the present day, bracken and its subsequent re-growth, has been both pulled and 'bashed' (where the plant stems are physically hit with wooden bats impregnated with nails).

5.1.4 Re-establishing Habitats Lost to Scrub

Example: Wildflower Meadow Restoration

Starting in the winter of 2006/7, BET commenced their long-term project to restore the once species-rich grasslands from recent scrub encroachment. The scheme also involved the laying and planting of hedgerows on the restored meadow boundaries. Since the scrub has been removed, the re-generation of the wildflower meadows has been both swift and dramatic with many hundreds of wildflowers now recorded in the grasslands.

Between 2006 and 2018, a total of 1.9 acres of wildflower meadows have been restored.

There are no plans to restore any more meadows during the term of this plan.



Example: Woodland Coppicing/Felling

Some sections of woodland on both reserves exhibit a very high density of predominately ash trees that were producing a dense shade, which was having a detrimental effect on the propagation of other tree species and spring flowers such as bluebells and wood anemones. Since the winter of 2007/8 and up to the present day, selected trees in these areas have been coppiced to let in more light. This has resulted in healthier, more robust trees and has improved the ground flora significantly.

In 2018, Jubilee Stone Wood comprised 90% woodland and 10% grassland whilst Badgers Wood comprised 92.5% woodland and 7.5% grassland.

Overall figures for the two reserves combined are 91.5% woodland and 8.5% grassland.

5.1.5 Linking Wildflower Meadows and Woodland Glades

When the land for the nature reserves was first acquired, the existing open areas of grassland were isolated from each other. This had a detrimental effect as many invertebrates would not have been able to move through dense woodland to colonise another area. Whenever possible, woodland glades have been expanded and areas of ancient wildflower-rich grasslands have been restored and linked together.

5.1.6 The Creation of New Habitats

Example: Wildlife Ponds

The underlying rocks in Jubilee Stone Wood are predominantly made up of Carboniferous limestone. This rock typically contains many faults and fissures and so consequently surface water associated with this type of geology is very rare. Because a source of water is essential to all animals on the reserve, two wildlife ponds were constructed between 2007 and 2009 in some of the many hollows created by the open cast lead mining of the 17th century. To ensure there is sufficient water in the ponds during drought conditions, water storage containers holding approximately 2,500 litres of rain water have been installed inconspicuously in the adjacent woodland.

Badgers Wood had a silted up dew pond constructed with puddled clay and a flagstone capping which was dug out in 2010 to create a wildlife pond on this reserve.

Example: Bird and Bat Nest Boxes

The mixture of old and new woodland interspaced with the recently created meadows, glades and rides form an excellent habitat for a wide range of both birds and bats. However, as most of the woodland is less than 50 years old, suitable nesting sites in old trees is in short supply so approximately 60 bird and 10 bat boxes have been put up across both reserves.

Example: Dormouse Nest Boxes

Both reserves have good numbers of dormice and summer nest boxes have been put up in suitable habitat across both reserves.

5.1.7 Archaeological Features

Both reserves have a number of interesting archaeological features, the most notable being the Warrener's Cottage dating back to the 14th century, evidence of lead mining from the 17th century and a lime kiln from the 19th century. Whenever any excavation or restoration work has been proposed, we have always sought expert archaeological advice before proceeding.

5.1.8 Improving Access to the Reserves

BET is committed to improving access to the woodland for all people including the less mobile. Between 2007 and 2010, two wheelchair-friendly trails were constructed running from the two small car parks to the viewpoints at the Jubilee Stone and over Coles Quarry in Badgers Wood.

In addition, between 2010 and 2014, three woodland paths, the Fern Way, the Geology Trail and the Community Trail were constructed on the northern slopes of Badgers Wood. Both the Fern Way and the Geology Trail pass through superb ancient woodland landscape whilst the

Community Trail was constructed to give a safe alternative to walking the single track carriageway section of Church Town.

Jubilee Stone Wood also has a public bridleway running the entire length of the reserve whilst Badgers Wood has a public footpath. In addition, numerous permissive paths have been created throughout both woodlands.

5.1.9 The BET Cabin

When BET purchased Badgers Wood in 2009, the land came with an extremely dilapidated garage close to the reserve's northern entrance. In 2012, designs were drawn up for its refurbishment and the work was subsequently carried out by BET volunteers over the next few years. The roof was replaced, new walls built, security doors fitted and double glazed windows installed.

The Cabin has been fitted out with solar lighting, rain water collection and a wood burning stove. It now serves the group as a base, meeting point and training room.



6 COMMUNITY INVOLVEMENT

6.1 Volunteers

BET performs all of its woodland management projects, as well as the day-to-day running of the group, almost exclusively with volunteers. Between 2005 and 2018, a total of 25,103 volunteer hours were recorded working for the charity.

6.2 BET Membership

BET typically has between 220 and 250 members who pay a small annual subscription.

6.3 The Queen's Award

In 2010, BET was awarded The Queen's Award for Voluntary Service.

The Queen's Award for Voluntary Service is the highest award given to local volunteer groups across the UK to recognise outstanding work done in their own communities. It was created in 2002 to celebrate the anniversary of The Queen's coronation.

6.4 Events

BET regularly holds events on the nature reserves for the benefit of the community highlighting the wildlife, archaeology and geology. Educational training courses have included hedgelaying, dry stone walling, grass and wildflower, bird and moth identification.

BET has also shared its knowledge outside of the locality by holding training days for scything and helping other local groups with various projects.

6.5 Community Use

The various footpaths are well used by walkers, from both the local community and further afield. Horses and cycles are permitted along the public bridleway in Jubilee Stone Wood.

6.6 Schools

Local schools, both junior and senior, make regular visits to the reserves to study the wildlife.

6.7 Website

BET has a very detailed and comprehensive website giving details of every aspect of the Trust as well as highlighting our ongoing projects. www.backwellenvironmenttrust.org

6.8 Bulletins

BET publishes two A5, full-colour bulletins per year to inform and update the members on the activities of the Trust. All past editions can be found on the BET website under 'Publications' or by using this link: [BET Bulletins](#)

6.9 Notice and Interpretation Boards

There are large wooden notice boards at the four entrances to the woodlands explaining the wildlife and history of the reserves. Each board has a leaflet dispenser giving visitors extra information about BET and a map of the reserves. The leaflet and map can be found on the BET website under 'Publications' or by using this link: [BET Leaflet and Maps](#).

Colour interpretation boards explaining the archaeological features and geology of the nature reserves can be found close to the paths.

When woodland management is being undertaken close to footpaths, temporary laminated notices are put up to explain the work being undertaken.

6.10 Community Talks

BET gives illustrated talks to the local community about the nature reserves and the work we are undertaking.

6.11 Publicity

BET is regularly featured in the local press which helps to publicise the group and to keep the wider public informed of our activities and discoveries. BET has also appeared on local radio and national television.

6.12 North Somerset Nature Net

BET is a member of the North Somerset Nature Net (NSNN) which is a group dedicated to the support of all smaller conservation groups within the county of North Somerset. The group shares its expertise, experience and equipment between members.

Website : northsomersetnaturenet.webs.com

7 HEALTH AND SAFETY

All footpaths are checked for potential safety issues on a regular basis and remedial action taken if necessary. Footpaths can become slippery in wet weather and warnings are displayed in the four entrance notice boards and on the BET leaflet.

Trees close to footpaths or roads are checked by BET for safety at least on an annual basis. (Trees along Cheston Combe Road outside BET's boundary are the responsibility of North Somerset Council).

Fences are checked at least every 3 months. (Note: All fencing on BET's nature reserves bordering the abandoned quarries in both Jubilee Stone Wood and Badgers Wood are the responsibility of the quarry owners – Mines and Quarries Act, 1954/Health and Safety at Quarries, Quarries Regulations, 1999).

Risk assessments are produced for each volunteer work session and for all events.

Volunteers are trained in the safe use of tools and the correct way to perform woodland tasks.

When tree felling is undertaken close to paths, suitable warning signs are erected.

At least one Certified First Aider is present at each work session together with a first aid kit and an automated external defibrillator (AED).

The use of mechanical trimmers is kept to the absolute minimum but, when necessary, only operators with suitable training are permitted to use them.

Chainsaws are used on the nature reserves for typically 2 to 3 days per year to assist with trees that are too large for our volunteers to fell safely. Only suitably qualified and insured contractors are used for this work.

The use of systemic herbicides is also kept to the absolute minimum with only suitably trained and approved personnel allowed to use them.

Ticks and Lyme Disease

Ticks are tiny spider-like creatures found in woodlands, heaths, parks and gardens throughout the UK, Europe and North America. They feed on the blood of birds and mammals, including humans, and some carry the bacteria responsible for Lyme disease (*Lyme borreliosis*). Both of BET's nature reserves contain ticks and so care should be taken to check for their presence after visiting the woodlands.

8 NATURE RESERVE MANAGEMENT STRATEGY

This strategy section was commissioned by BET and written by Dr Elizabeth Pimley, Principal Ecologist, Wild Service.

To ensure BET achieves the highest standards in woodland management, this work programme was compiled following the production of a comprehensive woodland management strategy by 'Wild Service', after a survey of our two nature reserves. Wild Service is a partnership between Avon Wildlife Trust and Gloucestershire Wildlife Trust and offers a full range of land management and ecological consultancy services.

BET engaged Wild Service's principal ecologist to determine BET's future woodland management strategy and vision for the next ten years. Dr Pimley has the following qualifications:

- Head of ecology and principal ecologist with Wild Service with an honours degree (BSc Hons) and doctoral degree (PhD) in zoology
- Member of the Chartered Institute of Ecology (MCIEEM)
- Chartered Environmentalist (CEnv)
- Natural England and Natural Resources Wales licences for bats and dormice
- Natural England licences for great crested newts and water voles
- Registered Consultant of the Bat Low Impact Class Licence (BLIC).

Management Objective	Management Intention
Maintain and continue to enhance the ecological value of the woodland ecosystem.	To enhance the ecological value and therefore biodiversity of the woodland, the mosaic of different habitat types will be maintained. For older broadleaved trees, a priority element is to reduce competition/shade gradually in the immediate vicinity of larger individual trees ('halo thinning'), whilst maintaining some of the surrounding canopy, at least until trees are more robust. The general recommendation is to gradually open up the stand around such trees while avoiding extraction damage. In some cases, re-pollarding some of the branches may help reduce the weight of the crown and encourage new growth. Such canopy thinning will reduce shade and therefore allow understorey and scrub regeneration thus increasing food and nest sites available for dormice and other wildlife. Natural regeneration often suffices in woodlands with a diversity of flora. In order to enable regeneration, it is essential to protect new

Management Objective	Management Intention
	tree growth from deer and rabbits. For small areas, the use of tree guards or piling brash over cut stumps and coppice stools may provide sufficient protection. Other larger areas may need temporary fencing. Should natural regeneration not prove successful in certain areas after five years, then native tree/shrub species of local provenance will be planted. Targeted and gradual thinning along the existing paths will benefit woodland ground flora and also provide habitat for insects, butterflies and reptiles. Tracks should be widened to 3-5m (as appropriate) and managed during dry conditions, aiming to maximise variation in height from short vegetation to scrub and canopy but also to create scalloped edges leaving occasional pinch points to enable animals (especially dormice) to move freely between compartments. This will be done over a number of seasons to ensure that conditions are not altered too rapidly and cause a negative impact on the wildlife assemblages. Standing dead wood provides an important habitat for invertebrates, birds, bats and various small mammals including dormice. It is therefore recommended that some dead/damaged trees, trunks (as long as they are not unsafe), rotten coppice and fallen/felled tree trunks are retained within the woodland, especially those with cracks and holes, which provide roosting habitat for bats and nesting habitat for dormice and woodpeckers. Coppicing of hazel to create temporary areas of open space shall enable native flora to re-flourish benefitting insects, butterflies, dormice and woodland bird specialists. However, it is possible that deer may prevent regeneration, resulting in the need to use deer fencing. Brash resulting from coppicing can be left in the wood to provide nesting habitat for woodland birds and for dead hedging around newly-cut stools or around cut coupes to reduce browsing of coppice regrowth. Alternatively, any surplus logs/brash should be burned on the same day or if this is not possible, then brash piles should be checked for small animals prior to burning. Some cut timber will be left in the woodland to rot down whilst logs can be stacked to create habitat piles. Where possible, the lower layers should be buried and a compact stack of wood created. Such log piles offer sheltered places for dormice to hibernate and provide habitat for other small mammals, reptiles and amphibians and the rotting timber itself provides a valuable habitat for a variety of invertebrates and fungi.

Management Objective	Management Intention
Manage and enhance the woodland with minimal disturbance to dormice.	Woodland operations should aim to maintain enhance the habitat for dormice. A key principle is to rotate woodland management, such as coppicing, hence leaving areas of the woodland undisturbed to act as reserves or 'refugia' from which the population can re-colonise the worked areas as they become more suitable. Woodland operations should also minimise the risk of harming dormice or damaging their breeding sites or resting places. In order to achieve the latter, woodland operations (felling, tree surgery, coppicing) will not be undertaken during the dormouse breeding period (between early June and September) when such activities will have the greatest impact on the local population and trees/shrubs will not be dug out between mid November and late March when dormice will be hibernating on/near the ground. Further details are provided below. Dormouse nesting boxes have been provided and are checked regularly by a licensed dormouse monitor. These boxes will be cleaned out at the end of the survey season (November) to remove old nest and ensure there is no build-up of parasites. Increase the number of dormouse nest boxes to 50 and consider reducing the checking of the boxes to two inspections per year to minimise disturbance.
Manage and enhance the woodland with minimal disturbance to reptiles.	Trees/shrubs will not be dug out between mid November and late March when reptiles will be hibernating on/near the ground. The creation/maintenance of glades and widening of rides in addition to the hazel coppicing will enhance the reserve for reptiles. To provide additional shelter for reptiles, a minimum of two reptile hibernacula and four log piles will be constructed in grassland areas. Each hibernaculum will consist of a pit filled with rubble, wood chips, timber and soil surmounted by turf. Each hibernaculum will be approximately 2m long x 1m wide x 1m high x 50cm deep.
Manage and enhance the woodland with minimal disturbance to nesting birds.	Removal of trees and shrubs will be undertaken between late August and late February which is outside the nesting bird season. The creation/maintenance of glades and widening of rides and hazel coppicing will enhance the value of the reserve for various species of woodland bird by creating more habitat niches (especially for summer migrants such as blackcap and chiffchaff) and better invertebrate habitat and therefore foraging opportunities.

Management Objective	Management Intention
Manage and enhance the woodland with minimal disturbance to bats.	Large trees especially those with holes/crevices/flaky bark/mature ivy provide suitable bat roosting features and should be retained in the woodland. Should it be necessary to fell such trees due to health and safety concerns, then any holes/cracks should be inspected prior to felling which should be undertaken between November to March, which lies outside the summer roosting period. Ideally such inspections should be undertaken by a bat-licensed ecologist. The creation/maintenance of glades and widening of tracks plus hazel coppicing will enhance the value of the reserve for bats by enhancing habitat for invertebrates and therefore bats. To enhance roosting opportunities for various species of bats, a combination of 10 Schwegler 2FN bat boxes (suitable for various species of bats) could be installed in the woodland reserve. Bat boxes should be installed at minimum heights of 2.5m and should face in different directions with south-west and south-east being favoured by bats.
Enhance Ponds	The ponds need to be kept open to the sunlight by careful scrub/tree cutting where over-shading occurs. With the caveat that where footpaths pass by the ponds, some scrub cover on that side is desirable to prevent dogs entering the water (explanatory signs requesting dog owners keep dogs out of the ponds may be useful).
Protect and increase existing deadwood	Significant deadwood (standing / fallen) will be preserved. The variety and abundance of deadwood will be expanded where possible. This may be achieved by waste arising from thinning operations and left <i>in situ</i> to degrade naturally as ground deadwood. In other areas, the creation of standing deadwood habitats by ring-barking turkey oaks (no more than 5% of the total per year) and allowing them to degrade standing over a longer period should be continued. The location of these resources would have to be well considered to prevent any risk of falling on woodland users.
Identify and protect veteran trees for long term retention	Mature broadleaved trees should be identified and specifically managed to ensure their long-term viability. Interventions will involve halo thinning to reduce canopy competition and maintain favourable growing conditions.

Management Objective	Management Intention
Low impact silvicultural systems and working methods	Biodiversity enhancement and conservation management will ensure a diverse woodland structure continues to evolve through the use of sensitive and sympathetic management. Specifically, the following silvicultural systems are proposed • Gradual thinning where dense stands of thin broadleaved trees exist to promote natural regeneration. With one third removed every four years. • Instating a 15-20 year coppice cycle in areas of former and current hazel coppice. This type of management will enhance the value of the woodland for the hazel dormouse. • Monitor for new spread / emergence of bracken and pendulous sedge as if left un-checked, these species have the potential to become invasive and out-compete other more delicate woodland plants. • Bracken can be controlled by cutting late July for five years or a two-cut system for three years. Livestock could be brought onto the site for winter feeding to trample on new buds (but stock must be removed in spring to prevent poisoning by bracken). Chemical means of treatment is another option, using the selective herbicide Asulam (Asulox) - to be applied once the fronds have fully expanded.

Management Objective	Management Intention
Monitor for pest/disease impacts and consider different management approaches to increase long-term resilience	Deer Damage. It is recommended to use tall shelters (min. 1.20m for roe deer) and suitable temporary fencing to protect natural regeneration, coppice, and introduced plant stock in replanting areas. Acute Oak Decline (AOD). The oak trees across the site appeared to be in good health and not displaying any symptoms e.g. stem bleeding. Current research indicates that AOD will preferentially target trees that are under stress as a result of neglect, under-management, root or tree damage, soil compaction etc. Therefore, oak trees should be managed effectively to minimise conditions conducive to stress and remain vigorous. Other precautions will include: • Monitoring for signs of the disease on a regular basis and especially during the spring and summer when signs are most visible • Infected trees are managed in accordance with the Forestry Commission's management guidance note • Implement good biosecurity measures in accordance with Forestry Commission best practice. Ash dieback. There is a proportion of ash trees in both woodlands forming the reserve. The risk of ash dieback should be addressed by controlling ash regeneration that is preventing alternative species from successfully regenerating; • Monitor for signs of the disease on a regular basis and especially during the spring and summer when signs are most visible • Management to actively address the stand environment e.g. increase air flow through canopy to reduce favourability for pathogenic spores • Favour removal of ash at thinning interventions • Implement good biosecurity measures in accordance with Forestry Commission best practice. General Points Encourage greater vigilance through better availability of information and education on all current and new plant health issues that threaten the woodland to help strengthen monitoring capabilities across all ranges of people that work in and visit the woodland. By encouraging a mixed species composition to develop that will reduce the likelihood of single species monocultures from developing. When introducing native broadleaved species, in addition to using species of local provenance, consideration should also be given to including species of neighbouring provenance to future proof the woodland against future threats such as climate change. Appropriate warning signage will be used where tree works occur near public footpaths.

8.1 Woodland Management for Dormice

The management recommendations below will enable woodland management works to proceed with minimal disturbance to the local dormouse population and also enhance the woodland for dormice and other wildlife. These recommendations will avoid a breach of the legislation as dormice and their resting places are protected under the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2017.

8.1.1 Timing of Woodland Operations¹

The table below summarises dormouse activities during the year in combination with the relative impact of woodland operations on the local dormouse population. The most sensitive period for dormice (and therefore greatest risk of causing damage, disturbance or harm) is primarily between early June and September when female dormice give birth and are suckling young, and secondarily, through the winter hibernation period (mid November – late March) when dormice are hibernating in nests on the woodland floor, often at the base of trees and shrubs (particularly coppiced stools) and cannot move out of harm's way.

Smaller scale coppicing, shrub clearance and felling (< 5 ha or < 25% of wood with suitable dormouse habitat) should be undertaken during the winter period (mid/late November to late March) when dormice are not using the canopy. The periods April-May and September-October are the best periods to undertake large-scale woodland operations. It should be noted that the April-May period coincides with the peak nesting period for woodland birds when disturbance should be avoided in bird-rich areas. In such cases and where clear-felling of large areas (> 5 ha or >25% of wood with suitable dormouse habitat) is required, works should be undertaken during September-October.

Areas of coppice should be inspected for dormice nests around the roots prior to tree removal during the winter (ideally by a dormouse licensed ecologist). Should any dormice nests be found, then the tree should be left standing until late April when the dormice should have finished hibernating and moved on. The tree roots should be subsequently re-inspected for dormice nests prior to felling.

Month	Activity state	Woodland operation impact
January	Hibernation	Moderate
February	Hibernation	Moderate
March	Hibernation	Moderate
April	Active	Low
May	Active	Low
June	Breeding period	High
July	Breeding period	High
August	Breeding period	High
September	Breeding period	High
October	Active	Low
November	Hibernation	Moderate
December	Hibernation	Moderate

¹ It should be noted that with all information on timings this is to a limited extent dependent on the climatic conditions for that year. Clearly if there a mild autumn then dormice could remain active for slightly longer and a cold spring could slightly delay dormice coming out of hibernation

8.1.2 Guidance on Habitat Management

Felling

No more than a third of suitable habitat in the woodland should be felled and the remaining areas of habitat should be retained for at least five years.

Thinning

It is recommended that no more than two-thirds of suitable habitat are thinned in any one year and the remaining habitat should be left undisturbed for several years.

Coppicing

It is recommended that no more than 25% of suitable habitat is coppiced in any one year, and ideally less.

Scrub cutting

When cutting back scrub, it is recommended that only a small proportion of the area is treated in any one year. Where branches must be pruned back across rides and tracks, it is important to maintain branch connectivity at intervals over rides and tracks.

Track construction or other ground-works

Where possible, routes should be created around areas of highest quality habitat for dormice.

8.1.3 Woodland Enhancement

Create gaps in the canopy

Opening up the canopy by felling some trees allows light to reach the woodland floor encouraging various woodland plants including wildflowers and eventually a scrubby understorey to develop. This provides food for insects, birds and mammals including dormice. Veteran trees should not be felled as these are not only of intrinsic ecological value but also provide valuable habitat.

Creation and maintenance of rides and glades

Rides and glades provide increased edge habitat within the wood and ensure light reaches the woodland floor. This effect can be further enhanced by cutting scallop edges into the wood along the rides. Branch connections over the rides should be maintained at pinch points at least every 50m to enable dormice to travel throughout the woodland. Ideally some mature fruiting hazel should be retained along ride sides.

Ensure damage to ground flora is minimised

Principles to follow include: keeping the number of tracks and paths in a woodland to a minimum to avoid excessive damage to the ground flora; it is recommended that some of the felled trees are left as dead wood, which provides hibernation sites for dormice; it is advisable to avoid burning material where possible. However, when the quantity of cut material produced necessitates burning, aim to burn all material on the same day or if this is not possible, then any brash piles should be checked for small animals prior to burning.

Maintenance and enhancement of tree and shrub diversity

In order to encourage species diversity in the woodland it is necessary to create a diversity of habitats such as woodland edges and rides, glades, ensure trees of different ages, dead wood and several woodland layers (i.e. tree canopy, shrubs, ground flora). As mentioned above thinning of the canopy will allow natural regeneration to occur and encourage structural diversity. Creation of species diversity within the woodland can where necessary, be reinforced by planting species native to the site, and of local provenance. Through creating a woodland with a diversity of habitats and therefore species, the variety of food sources available to dormice and other wildlife are increased.

Maintain arboreal connectivity

In order to ensure that dormice have access to areas of suitable habitat both within the woodland and in adjoining areas, it is essential to maintain a continuous connection between shrubs and trees throughout the wood. In addition, the retention of brash, bramble and some bracken across felling areas will enhance connectivity of these cleared areas to the rest of the woodland.

Retention of climbing plants and bramble

Climbing plants such as ivy, honeysuckle and wild clematis provide good links between the shrub and canopy layer as well as providing additional habitat and autumn food for dormice, birds and invertebrates. As a general rule, it is advisable not to remove ivy from trees unless it has grown to the point where it shades the understorey. Bramble is a very useful shrub that provides food and shelter for many species including dormice over a long period and can develop as part of the felling cycle.

Creation of linked coppice blocks

In order to create a mosaic of mixed aged coppice it is recommended that several smaller plots of up to ¼ ha (but not exceeding 25% of the total area each year) are cut rather than one large plot. In order to retain connectivity, it is necessary to keep coppice coupes linked either with intermediate blocks or along an edge so that no areas become isolated due to coppicing. The complete coppicing cycle should be undertaken over approximately 15-20 years to ensure that coppiced plants produce nuts prior to coppicing.

Derelict coppice

Where hazel coppice has not been cut for at least 30 years (stem diameter >150mm), cutting may not produce much regeneration and gaps may need to be replanted. In order to restore derelict coppice, a small coupe of no more than ¼ ha (but not exceeding 25% of the total area each year) should be cut per year in non-adjacent blocks. It should be noted that to restore derelict coppice it is often necessary to cut all the coppice again after three years to allow the new plants to produce more stems and grow up strongly.

Create a variable age structure

To ensure the longevity of a coppiced woodland, it is necessary to initiate some new coppice stools by layering from existing stools and selecting some new standard trees and allowing them to develop. Thereby creating a better age structure to the wood and ensuring that there is timber provision for the future. For hazel coppice, a rotation of 15-20 years is recommended in order to

allow hazel sufficient time to mature and produce nuts, which can be eaten by dormice. (The traditional seven to eight-year cycle to produce saleable rods may not allow hazel enough time to mature and produce nuts).

8.2 Grassland Management Strategy

Wildflower diversity will be maximised by undertaking a late cut or cutting areas on rotation and removing the arisings. Cutting grassland annually in late summer (ideally not until August) allows the flowers to produce and shed seed to replenish the botanical diversity and removal of cuttings (arisings) prevents a mulching effect and possible leaching of nutrients during breakdown which would benefit the growth of coarse grasses over flower species. An additional cut in March or October would help to increase the botanical diversity, again removing all cuttings.

A late summer cut will benefit reptiles (that are likely to be present in the grassland areas), providing refuge during the year up until they hibernate in autumn/early winter. Scalloping and grading of scrub along the boundaries will create shelter and micro habitats that are important for invertebrates. Scattered scrub will occasionally require removal and treatment to prevent re-growth. Scrub cutting should be undertaken during autumn/winter (September to February) when birds are not nesting.

Bramble in particular can encroach on grassland areas if not controlled, although a small amount of cover from bramble is beneficial to reptiles (bramble/shrub cover should be no more 20% of the site area). Bramble can be treated with a systemic herbicide that must be carefully selected and applied so that it does not affect anything other than the target species. A suitable herbicide is glyphosate ('Roundup' pro-biactive/ProBio 360 or similar) since this becomes inert on contact with the soil and will only affect plants that have been spot treated.

Bracken can also spread over open areas if not controlled and will be treated with a selective herbicide such as Asulam (Asulox) to prevent it encroaching. The herbicide should be sprayed July-August, once the fronds have expanded. Bracken can be controlled by cutting late July for five years or a two-cut system for three years. Livestock could be brought onto the site for winter feeding to trample on new buds (but stock must be removed in spring to prevent poisoning by bracken).

Where fallen or lying dead wood occurs, this will be left, when possible, in order to provide additional areas of shelter for reptiles.

9.1 Introduction

BET's top priority is to establish an effective work programme for the next ten years, with the primary objective of maintaining and enhancing the various diverse habitats in our two reserves. They contain an extremely wide variety of plants and animals, including numerous species included in the UK Biodiversity Action Plan (UK BAP) that lists the species that are considered most at risk and in urgent need of conservation. Other rare species on the reserves are also further protected under both United Kingdom and European Union laws.

9.2 Managing the Woodlands

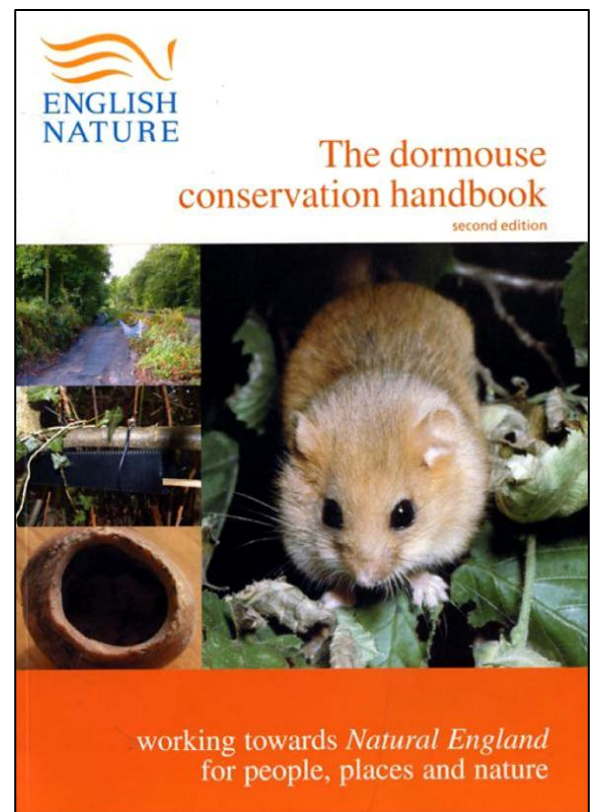
Overall, BET's nature reserves are made up of 91.5% woodland (2018) and their management has been, and will continue to be over the next ten years, heavily influenced by the need to maintain and gradually improve the habitat for hazel dormice. Therefore, creating the best possible woodland habitat for dormice, whenever possible, across our 22 acres has been a major factor in the compilation of this ten-year plan. BET's two nature reserves contain high numbers of this rare and protected species, however studies have shown a sharp decline in their numbers over recent years across the UK.

Fortunately, what is generally considered good habitat for dormice, also suits virtually all other species including birds, bats and invertebrates.

The English Nature Dormouse Conservation Handbook (Section 4: Habitat Management) concisely summarises our objectives for woodland management over the next ten years:

'...the aim should be to maintain or create woodland with a high species diversity, a mosaic of age classes and a multi-storied canopy including plenty of links between different levels of the canopy and undergrowth. There should also be links – via suitable hedgerows and other scrubby habitats – across the whole woodland landscape.'

'Management involves periodic removal, coppicing or killing of trees to limit the density of the canopy layer and maintain a well-lit understorey.'



At present (2018), large sections of the woodlands have a 90-100% coverage of high canopy trees (defined as trees >10 metres high) which severely restricts the amount of sunlight reaching the woodland floor. Consequently, the underlying scrub layer (defined as trees in the range approximately 2 to 7 metres high) and bramble (typically 0.5 – 2 metres high), are either not present or are struggling to survive. Both of these habitats are of vital importance to dormice,

9.3 Ten-Year Work Programme

The work programme for the next ten years was compiled by BET after the production of the comprehensive woodland management strategy (Section 8) by the external consultancy 'Wild Service'.

The objectives and tasks detailed in the work programme were compiled with full adherence to the strategy, and have subsequently been approved by Wild Service.

BET has also been advised by numerous other wildlife experts whose specialist knowledge has been invaluable in formulating this work programme. Additional input to the plan has been received from a senior archaeologist and a geologist.

The work programme has been structured and presented as follows:

- Nine areas of our two nature reserves have been identified as benefitting from specific woodland management tasks – six in Jubilee Stone Wood and three in Badgers Wood.
- These woodland 'compartments' are described in Table 1 and have been designated as JSW1-6 and BW1-3. The locations of the compartments are shown in Figure 4 and Figure 5.
- Tables 2-4 describe the tasks to be carried out in each woodland compartment.
- Tables 5-10 describe the tasks for all other key habitats (e.g. hedgerows, meadows) as well as the archaeological and geological features.
- Figure 6 and Figure 7 show the woodland and understorey distribution for the two reserves as well as the location and names of the wildflower meadows.
- Each table describes the primary objectives, tasks and timescales for all the tasks listed.

Overall, approximately 60% of the 22 acres comprising the reserves is covered by these tables and the associated programme of reserve management. It is envisaged that the remaining 40% will be continually monitored but not actively managed during this ten-year time period.

Note: the tables use the term 'coppice' to describe when a tree is felled and the subsequent re-growth is protected from deer grazing. For the purposes of this plan, only hazel trees fall into this category. The term 'fell' is used when all other trees are coppiced but the cut stools are not actively protected from grazing which may well hinder their subsequent re-growth.

9.4 Vision

By 2028, after the all objectives of this ten-year plan have been achieved, the nature reserves will exhibit:

- Woodlands with large, multi-layered tree canopies developing at different heights with dense bramble scrub below.
- A better distribution of different tree species throughout the woodlands with a more diverse age structure.
- Numerous arboreal links between the various tree canopy layers and throughout the whole of the woodland landscape.
- A higher quality woodland habitat for dormice.

- An increase in the number of wildflowers in the restored meadows.
- An increase in the number of woodland glades.
- Selected pathways widened to form 'rides'.
- All invasive species, both native and non-native, under control.
- All pathways (bridleways, footpaths and permissive paths) well marked and in good order.
- Additional archaeological features and dry stone walls restored.
- The significant geological features exposed.

10 MONITOR AND REVIEW

This management plan will be reviewed annually by the trustees to ensure the work programme continues to deliver the required results.

Photographic records will be kept to identify changes to the flora on the nature reserves.

Dormouse surveys will be performed to monitor the status of this protected species over time and the results shared with The National Dormouse Monitoring Programme (NDMP).

Bird boxes will be inspected annually and the results recorded.

The nature reserves' combined species list shall be updated as appropriate and the results shared with the Bristol Regional Environmental Records Centre (BRERC).

BET will monitor the satisfaction of visitors and members by maintaining good communications (telephone, email, or letter) and holding an annual general meeting (AGM).

11 ACKNOWLEDGEMENTS

BET would like to thank the following for their contributions to this Management Plan:

Woodland & Grassland Management:

- Dr Elizabeth Pimley, Wild Service
- Joe McSorley, Avon Wildlife Trust
- Tim Curley, Avon Wildlife Trust
- Dr Tony Smith, Bristol Naturalists
- Lyndsay Moore, Ecologist and Botanist
- BET Trustees and Members

Archaeology:

- Vince Russett, County Archaeologist (retired)

Geology

- Richard Kefford, Avon RIGS Group

<u>Table 1 - Nature Reserve Compartments (Figure 4 & Figure 5)</u>	
Compartment	Compartment Description
JSW 1	Located at the lowest section of the reserve with a north-westerly sloping aspect, this compartment is located to the north-east of the bridleway, with a mature ash tree at its centre. The woodland here is characterised by a mixture of previously thinned, tall and thin broadleaf trees with regenerating ash coppiced stools. Numerous turkey oaks have either been felled or ring-barked. Ash is the dominant species with lesser amounts of hawthorn and turkey oak. There are also small, immature self-seeded tree species of hazel, oak, beech, holly and cherry. The ground flora contains large patches of bluebells, wild garlic and dog's mercury. There are also lesser patches of wood anemone. The woodland has only been in existence since the 1960s before which the land was described as 'pasture' (see Figure 3). To date there has been no evidence of dormice in this compartment.
JSW 2	Located at the lowest section of the reserve, generally with a north-westerly sloping aspect but also sloping steeply down to Cheston Combe Road on its south-western edge. The compartment starts from the lowest 17th century lead mine mound and ends at the start of the wildflower meadow by the seat. This compartment contains approximately 95% high canopy trees (trees > 10 metres high), 5% mid-height woodland (trees in the range approximately 2 - 7 metres high) and 15% understorey plants, primarily bramble (0.5 - 2 metres high) It is made up of densely-packed, tall and thin, broadleaf trees, virtually all of the same age (approximately 30-50 years old), with ash being the dominate species. The high density of trees in this area creates a deep shade which results in little sunlight reaching the woodland floor. The section of this compartment running parallel with Cheston Combe Road was partially thinned about three years ago which has led to the rapid growth of the many hazel trees. There are also lesser amounts of hawthorn, oak, beech, turkey oak, holly and cherry. There are only two large, mature ash trees in the compartment greater than 50 years old. The woodland has only been in existence since the 1960s before which the land was described as 'pasture' (see Figure 3). The compartment also contains large patches of bluebells.

JSW 3	Located between the first link path to Badgers Wood at its lowest point and the second link path to Badgers Wood at its highest point. The compartment has a north-westerly sloping aspect and is bordered by Cheston Combe Road to the north-west and a restored wildflower meadow to the east. This compartment contains approximately 90% high canopy trees (trees > 10 metres high), 10% mid-height woodland (trees in the range approximately 2 - 7 metres high) and 90% understorey plants, primarily bramble (0.5 - 2 metres high). It is made up of very tall, broadleaf canopy trees (approximately 20 metres high), mainly ash and hawthorn, with lesser amounts of hazel, oak, whitebeam and silver birch. Although there is only a medium density of trees in this compartment, all the trees have developed a very wide canopy creating a dense shade on the woodland floor. All trees are of a similar age (approximately 40 years old). The section adjacent to Cheston Combe Road was first thinned in 2012 which has led to a rapid growth of the hazel trees growing there. There is the potential for a very promising understorey to develop in this compartment as there are significant amounts of hazel and bramble below the heavily shading canopy trees. The woodland has only been in existence since the 1960s before which the land was described as 'pasture' (see Figure 3). The compartment also contains significant patches of bluebells and primroses.
JSW 4	Located between the second link path to Badgers Wood at its lowest point and the ponds at its highest point. The compartment has a north-westerly sloping aspect and is bordered by Cheston Combe Road to the north-west and a restored wildflower meadow to the east. This compartment contains approximately 95% high canopy trees (trees > 10 metres high), 1% mid-height woodland (trees in the range approximately 2 - 7 metres high) and 2% understorey plants, primarily bramble (0.5 - 2 metres high). It is made up of tall (approximately 10 metres high), very densely packed, broadleaf canopy trees with a typical spacing between trees of only 1 metre, leading to virtually no sunlight reaching the woodland floor. The trees are mainly ash and hawthorn, with lesser amounts of sycamore, whitebeam and yew. All trees are of a similar age (approximately 30 years old). The woodland has only been in existence since the 1960s before which the land was described as 'pasture' (see Figure 3).

JSW 5	Located on a level section of the reserve between the Warrener's Cottage and the Horsering meadow. The compartment edge is located close to Cheston Combe Road to the north-west and the permissive path to the east. This compartment contains approximately 95% high canopy trees (trees > 10 metres high), 10% mid-height woodland trees (in the range approximately 2 - 7 metres high) and 15% understorey plants, primarily bramble (0.5 - 2 metres high). Trees closer to the north-western edge of the compartment are typically high canopy broadleaf trees approximately 20 metres high and in the age range 20 to over 70 years old, growing at a medium density, resulting in moderate to high levels of shading on the woodland floor. Towards the south-eastern edge of the compartment, the trees become gradually smaller (approximately 10 metres high) and much more densely-packed. Here the trees are virtually all of the same age, approximately 30-40 years old. Ash and hawthorn are the dominate species. There are several mature ash trees in this compartment. The low light levels on the woodland floor inhibit most understorey plants. Starting at the south-eastern edge (the Horsering meadow) and continuing for 100 metres in a north-westerly direction, the section adjacent to Cheston Combe Road was fully coppiced approximately 10 years ago. The woodland has only been in existence since the 1960s before which the land was described as 'pasture' (see Figure 3).
JSW 6	Located on a level section of the reserve between the Horsering meadow and the car park. The compartment edge is located close to Cheston Combe Road to the south-west and the bridleway to the north-east. This compartment contains approximately 95% canopy trees in the range 7 - 10 metres high, 15% mid-height woodland trees (in the range approximately 2 - 7 metres high) and 5% understorey plants, primarily bramble (0.5 - 2 metres high). It is made up of very densely-packed (typically only a 1 metre spacing between trees), tall and thin, broadleaf trees, virtually all of the same age (approximately 30 years old) with ash and hawthorn being the dominate species. The low light levels on the woodland floor here inhibit most understorey species. The woodland has only been in existence since the 1960s before which the land was described as 'pasture' (see Figure 3).
BW 1	Located on a generally level section of the reserve between the old recycling centre quarry viewpoint (approximately 250 uphill from the Cabin) and the (recently restored) public footpath leading down to Cheston Combe Road. This compartment contains approximately 100% high canopy trees (trees > 10 metres high), 1% mid-height woodland (trees in the range approximately 2 - 7 metres high) and 1% understorey plants, primarily bramble (0.5 - 2 metres high). It is made up of tall (10 to 20 metres high), densely-packed broadleaf trees in the age range 30 – 50 years with ash, turkey oak and yew being the dominant species, with lesser amounts of oak, holly and cherry. The very low light levels on the woodland floor here inhibit virtually all mid-height and understorey plant species. To date there has been no evidence of dormice in this compartment.

BW 2	Located on a north-easterly orientated gentle slope, opposite the second link path to Jubilee Stone Wood, the public footpath fence and the restored wildflower meadows (the middle and lower meadows - see Figure 7). This small compartment contains approximately 95% high canopy trees (trees > 10 metres high), 15% mid-height woodland (trees in the range approximately 2 - 7 metres high) and 5% understorey plants, primarily bramble (0.5 - 2 metres high). It is made up of tall broadleaf trees with an age range of approximately 30 – 60 years old with ash trees being the dominant species. There are also lesser amounts of yew, turkey oak, holly, oak and hazel. There are several mature trees growing in this compartment. The low light levels on the woodland floor inhibit most understorey species.
BW 3	Located on a north-easterly orientated gentle slope between the second link path to Jubilee Stone Wood and the upper most section of the reserve. It is made up of tall, broadleaf trees with an age range of approximately 30 – 60 years with ash and yew being the dominate species. There are also lesser amounts of turkey oak, holly oak and hazel. There are several mature trees growing in this compartment. This compartment contains approximately 90% high canopy trees (in the range 10-20 metres high), 20% mid-height woodland (trees in the range approximately 2 - 7 metres high) and 25% understorey plants, primarily bramble (0.5 - 2 metres high). This compartment has seen a rapid growth in mid-height trees, mainly hazel, after a section was partially thinned in 2011.

Note: The percentages refer to each individual vertical layer in the woodland (high, medium and low) and will therefore not add up to 100%.

Table 2 - Jubilee Stone Wood: Compartment 1 (Figure 4)

PRIMARY OBJECTIVES	To improve the habitat for bluebells and other spring flowering plants. To maintain an open tree canopy to ensure sufficient sunlight continues to reach the woodland floor.
TASKS	Fell all diseased ash trees to slow the spread of ash die-back disease. Fell tall and thin ash trees to achieve a minimum spacing of 4 metres between trees and to prevent the woodland floor becoming too shaded. Cut encroaching bramble on an annual basis. If natural regeneration of tree seedlings does not occur within 5 years, plant small, bare-rooted hazel trees using locally sourced stock. Protect the young trees with piles of brash or fit deer guards to deter browsing. Layer existing mature hazel trees to increase the number of this key tree species.
TIMESCALES	Perform all tasks between November and February, but cease operations if the winter is mild and the bluebells start to appear early. Cut encroaching bramble on an annual basis 2018 – 2028. Review the tall tree canopy density every 4 years.

Table 3 - Jubilee Stone Wood: Compartments 2 - 6 (Figure 4)

**PRIMARY
OBJECTIVES**

To reduce the tall and thin tree canopy percentage by approximately 33%. Increase the density of mid-height trees to between 60 - 80%. Increase the understorey plants (bramble) to between 70 - 90%.

To improve the habitat for dormice, bats, birds and invertebrates.

To fell selected tall and thin, predominately ash trees to improve the health of the remaining trees and thereby increase the relative numbers of non-ash tree species.

To retain mature and veteran trees as potential nest sites.

To remove any diseased trees (especially those with ash die-back disease).

To diversify the age range of the trees.

To reduce competition to mature trees by 'halo thinning'.

To encourage a more diverse understorey/ground flora to develop by increasing the light levels on the woodland floor.

To preserve the archaeological features.

To maintain the health of the ponds (JSW 4)

TASKS	Fell tall and thin canopy (>10 metres high) trees with preference given to the felling of ash trees to create a reduction in the high canopy tree cover by approximately 33%. Fell all diseased ash trees to slow the spread of ash die-back disease. Aim for a minimum of a 4 metre spacing between trees. Fell trees in the vicinity of the existing mature trees ('halo thinning'). If there are insufficient mid-height trees present, pollard trees to create them Coppice hazel trees over approximately 15 years old. (Delay coppicing until sufficient high canopy trees have been felled to increase light levels on the woodland floor which will ensure rapid re-growth from the coppiced hazel stools). Cut no more than 5m³ of timber across both reserves in a calendar quarter. Stack logs in piles and either stack or burn small branches on single, small fire site well away from spring flowers and paths. Layer hazel branches to increase the number of this key species. Plant additional hazel trees (with protection from deer) if there are insufficient existing self-sown seedlings after 5 years. Remove ivy on trees only if it poses a potential health and safety risk by being too close to the road or footpath. Put up bat boxes and clean out bird boxes. Clear vegetation from the archaeological features. JSW 4 only: Coppice/fell trees and scrub around the ponds to remove shading. Allow scrub to develop on the path side to reduce disturbance to the ponds. JSW 5 only: Fell trees and remove the vegetation from within the boundary of the archaeological feature (The Warrener's Cottage) if this can be safely achieved without damaging the structure.
TIMESCALES	Perform tasks between November and February/early March (the end date will be influenced by the winter temperatures). Review the shade levels resulting from the remaining canopy trees every 4 years to maintain the 33% high canopy reduction. Coppice hazel trees on a 15 – 20 year cycle. Remove leaf-litter from the ponds at least every 3 years in late summer. Clean out bird boxes annually between mid-November and the end of January.

Table 4 - Badgers Wood: Compartments 1 - 3 (Figure 5)

PRIMARY OBJECTIVES	To reduce the tall and thin tree canopy percentage by approximately 33%. Increase the density of mid-height trees to between 60 - 80%. Increase the understorey plants (bramble) to between 70 - 90%. To improve the habitat for dormice, bats, birds and invertebrates. To fell selected tall and thin, predominately ash trees to improve the health of the remaining trees and thereby increase the relative numbers of non-ash tree species. To retain mature and veteran trees as potential nest sites. To remove any diseased trees (especially those with ash die-back disease). To diversify the age range of the trees. To reduce competition to mature trees by 'halo thinning'. To encourage a more diverse understorey/ground flora to develop by increasing the light levels on the woodland floor.
TASKS	Fell tall and thin canopy (>10 metres high) trees with preference given to the felling of ash trees to create a reduction in the high canopy tree cover by approximately 33%. Fell all diseased ash trees to slow the spread of ash die-back disease. Aim for a minimum of a 4 metre spacing between trees. Fell trees in the vicinity of the existing mature trees ('halo thinning'). If there are insufficient mid-height trees present, pollard trees to create them Coppice hazel trees over approximately 15 years old. (Delay coppicing until sufficient high canopy trees have been felled to increase light levels on the woodland floor which will ensure rapid re-growth from the coppiced hazel stools). Cut no more than 5m³ of timber across both reserves in a calendar quarter. Stack logs in piles and either stack or burn small branches on single, small fire site well away from spring flowers and paths. Layer hazel branches to increase the number of this key species. Plant additional hazel trees (with protection from deer) if there are insufficient existing self-sown seedlings after 5 years. Remove ivy on trees only if it poses a potential health and safety risk by being too close to the road or footpath. Put up bat boxes and clean out bird boxes.

TIMESCALES	Perform tasks between November and February/early March (the end date will be influenced by the winter temperatures). Review the shade levels resulting from the remaining canopy trees every 4 years to maintain the 33% high canopy reduction. Coppice hazel trees on a 15 – 20 year cycle. Remove leaf-litter from the dew pond at least every 3 years in late summer. Clean out bird boxes annually between mid-November and the end of January.
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	<u>Table 5 - Jubilee Stone Wood & Badgers Wood: Hedgerows (Figure 4 & Figure 5)</u>
DESCRIPTION	The reserves contain over 1 km of hedgerows, most of which have been laid to improve the boundary and wildlife habitat. Two sections of hedge have been identified for particular attention over the term of this plan. JSW: A hedge runs along the entire length of the public bridleway from the Jubilee Stone to the car park. The section to be laid starts approximately 20 metres from the car park, heading in the direction of the Jubilee Stone, for 150 metres. This section of hedge was first laid in 2008 and is primarily made up of ash and hawthorn trees. The trees making up the hedgerow are in the age range 30 - 60 years old. BW: A hedgerow divides the top meadow from the public footpath whilst another borders the top and middle meadows and Coles Quarry. Both are primarily made up of ash and hawthorn and were first laid in 2009/10.
PRIMARY OBJECTIVES	To improve the habitat for dormice, bats, birds and invertebrates. To hedgelay the trees on both reserves to create dense, living hedges. To remove any ash trees with ash die-back disease. To encourage a more diverse understorey/ground flora to develop by increasing the light levels on either side of the bridleway/footpath. To fill in any gaps in the hedges.
TASKS	JSW: Hedgelay all trees along the 150 metre section (Figure 4). BW: Hedgelay all trees along the footpath adjacent to the top meadow and all Coles Quarry boundaries (). Leave 'standard' trees at approximately 10 – 15 metre intervals along the entire length. If possible, select 'standard' trees that form an arboreal link to the woodland but ensure that the link is retained at least every 30 metres. Remove all ash trees showing signs of ash die-back disease. Trim or weave into the hedge, any side branches encroaching on the bridleway/footpath. Plant hazel trees in any gaps in the hedges.
TIMESCALES	Hedgelay between November and February/early March.

	<u>Table 6 - Jubilee Stone Wood & Badgers Wood: Meadows (Figure 6 & Figure 7)</u>
DESCRIPTION	In total, approximately 1.9 acres of wildflower meadows on both reserves have been restored since 2006. They are of historical importance and have been in existence for at least 700 years and the available evidence would suggest they may well date back many thousands of years. Most of the meadows contain typical limestone grassland wildflower species except one area with acid soil (pH = 5.5) which contains many 'limestone heath' species. Whilst one meadow in Badgers Wood (of area 100 metres x 10 metres) has been sown with UK-sourced wildflower seed, all other meadows have been allowed to regenerate naturally. There are no plans to restore any more meadows over the term of this plan.
PRIMARY OBJECTIVES	To improve the habitat for small mammals, bats, birds, butterflies and invertebrates. To stop the encroachment of invasive species such as tree seedlings, bramble and bracken. To increase the number of wildflowers by the annual scything of the meadows. To encourage wildflowers to grow in areas where grass has become the dominant species. To improve the habitat for reptiles by creating at least two hibernacula.
TASKS	Cut the wildflower meadows, preferably using hand scythes and rake off. All cut material to be placed in piles on the edge of the meadows. Leave approximately 5% of each meadow uncut each year (different areas each year). If necessary, use mechanical trimmers to cut the thicker woody growth of tree seedlings. In meadows close to agricultural fields, remove the seed-heads of ragwort and thistles to stop their spread onto adjacent land and/or reduce their density by pulling out the plants if they occur in high numbers. In meadows with lower densities of wildflowers, remove approximately 2 metre x 2 metre areas of grass at selected intervals and plant with seeds collected from adjacent meadows or from UK-sourced commercial seed. Create at least one reptile hibernaculum in both Jubilee Stone and Badgers Wood meadows. Dimensions: 0.5 metres deep, 2 metres long, 1 metre high, 1 metre wide.
TIMESCALES	Cut meadows annually between mid August and December. Sow wildflower seeds in the spring or autumn. Construct at least two reptile hibernacula in the spring or summer.

Table 7 - Jubilee Stone Wood & Badgers Wood: Glades & Rides

DESCRIPTION	Both reserves contain examples of glades and rides located throughout the woodlands. The largest glades (approximately 20 metres x 20 metres in area) are located in Jubilee Stone Wood around the two wildlife ponds and the Warrener's Cottage whilst many other smaller examples are to be found close to the footpaths. The creation of sheltered, sunny glades has a dramatic effect on the microclimate and is beneficial to almost all species of flora and fauna. Existing 'rides' through the woodlands are typically 2 – 3 metres wide at present and would benefit from additional widening.
PRIMARY OBJECTIVES	To create additional glades at suitable locations in both woodlands to improve the habitat for dormice, bats, birds, butterflies and invertebrates. To create a warmer microclimate to extend the growing/active seasons for both flora and fauna. To remove diseased ash trees (especially those with ash die-back disease). To widen tracks, where applicable, to 3 – 5 metres to create a wider range of vegetation heights whilst ensuring arboreal connectivity is maintained. To create a gradual transition from meadows to woodland by promoting scrubs and bramble to develop at the woodland edge.
TASKS	Create additional small glades by coppicing trees in selected areas. Fell all diseased ash trees to slow the spread of ash die-back disease. Retain smaller trees and bramble close to the woodland edge. Give preference to glades orientated with a southerly aspect to maximise the number of sunshine hours received. Where glades are linear in nature, shape into scallops or bays to break up any possible 'wind tunnel' effects. Widen tracks, where applicable, to 3 – 5 metres whilst ensuring arboreal connectivity.
TIMESCALES	Glades and ride widening to be carried out during the winter months. Cut vegetation close to the paths to stop encroachment throughout the year.

	<u>Table 8 - Jubilee Stone Wood & Badgers Wood: Bridleways, Footpaths & Permissive Paths</u>
DESCRIPTION	Jubilee Stone Wood has two bridleways running through the woodland whilst Badgers Wood has two public footpaths. Both woodlands contain numerous permissive paths, with a total of 400 metres of level trails, surfaced to allow wheelchair access.
PRIMARY OBJECTIVES	To maintain all public bridleways, public footpaths and permissive paths on the nature reserves in good order. To maintain all steps on paths. To cut back vegetation encroaching on the paths. To widen paths, where possible, to 3 – 5 metres to create a wider range of vegetation heights and additional habitat. To maintain all fencing in good order. Note: both reserves have areas that border onto abandoned quarries. Under the Mines and Quarries Act, 1954, the quarry owners are legally responsible for the maintenance and repair of all fences around the perimeter of the quarry.
TASKS	Bridleways: Cut back vegetation to allow a minimum width of 2.5 metres and a minimum height of 3.5 metres (legal requirement). Footpaths: Cut back vegetation to allow a minimum width of 1.5 metres and a minimum height of 2.5 metres (legal requirement). Bridleways, Footpaths & Permissive Paths: widen paths, where applicable, to 3 – 5 metres, but every 10 metres, leave a 0.5 metre section uncut to discourage paths from being artificially widened by horse riders and/or walkers. Ensure all public paths are adequately signposted. Maintain steps and repair or replace as necessary. Ensure the wheelchair-friendly trail crushed-stone surfaces are kept in good order. Maintain benches. Maintain and repair fences.
TIMESCALES	Cut all rights of way on a regular basis to maintain at least the legal width and height.

Table 9 - Jubilee Stone Wood & Badgers Wood: Invasive Species

	<u>Table 9 - Jubilee Stone Wood & Badgers Wood: Invasive Species</u>
DESCRIPTION	Both reserves contain invasive species of plants, some native and some introduced into the UK. Native species: Bracken is present on both reserves, mainly in the wildflower meadows. Ragwort and thistles are extremely important wildflowers for invertebrates but the high number of their wind-blown seeds that germinate can cause problems for BET's developing wildflower meadows. We also have a legal obligation to stop these species spreading into the adjacent agricultural fields (The Weeds Act, 1959). Introduced species: There are considerable numbers of turkey oaks on both reserves. The garden hedging shrub, Box or Wilsons honeysuckle (<i>Lonicera nitada</i>) is also present on both reserves. Species such as Spanish bluebell and Winter heliotrope are to be found just outside the reserves but have not as yet migrated into the woodlands. Buddleia is found on the reserves but has not become invasive, so the existing plants have been retained as a valuable nectar source for pollinators.
PRIMARY OBJECTIVES	To gradually remove turkey oaks from both reserves. To remove the garden escape, <i>Lonicera nitada</i> from both reserves. To remove 95% of the bracken from the wildflower meadows of both reserves. To curtail the spread of wind-blown ragwort and thistle seeds to the wildflower meadows and adjacent agricultural land. To be vigilant to the encroachment of non-native invasive species onto the reserves. To retain standing dead wood.

TASKS	To fell selected turkey oaks on both reserves where safe to do so. To ringbark and apply systemic herbicide to turkey oaks where safe to do so, at a rate of up to 5% of the total per year. (The decision whether to fell or ringbark any individual tree will depend on the safety implications of its location within the woodland). Cut and apply systemic herbicide to the stems of <i>Lonicera nitida</i>. However, where it occurs in large, dense patches, leave uncut as it can provide excellent nesting sites. Pull bracken, or 'bash' the stems, in the wildflower meadows, but leave on the meadow margins. If ragwort and thistle numbers are very high in any particular area, remove approximately 70% of the plants by pulling. If the numbers of these species are considered manageable, allow to flower and then remove the seed heads before the seeds are fully formed to prevent seeding.
TIMESCALES	Fell and ringbark turkey oaks gradually during the winter months. Pull, or 'bash', bracken during the summer months. Cut and apply systemic herbicide <i>Lonicera nitida</i> during the winter months on an annual basis. Reduce ragwort and thistle numbers and/or remove seed heads during the summer months.

	<u>Table 10 - Jubilee Stone Wood & Badgers Wood: Archaeology, Walls & Geological Features</u>
DESCRIPTION	Both reserves are extremely rich in archaeological features. The most notable discovered so far are located in Jubilee Stone Wood – the 14th century Warrener's Cottage, the 17th century lead mines and the 19th century lime kiln. However, old maps show many other structures on both reserves which may be the focus of excavations in the future. Both reserves contain considerable lengths of both dry stone and lime mortared walls dating from the early 1800s. Both reserves contain important geological features. Jubilee Stone Wood has a long history of mining with ores of lead, copper, zinc, barium and iron present, all associated with a linear fault line running down the centre of the reserve. Badgers Wood has large areas of superb exposed Carboniferous limestone outcrops as well as an exceptionally rare 'limestone pavement'.
PRIMARY OBJECTIVES	To educate the public on the historical significance of the nature reserves and their corresponding geological features. To protect and preserve the known archaeological sites. To excavate new, suitable prospective archaeological features. To restore sections of collapsed walls. To expose the important geological features. To allow vegetation to naturally colonise the fissures, known as 'grykes,' in the limestone pavement. To classify the limestone pavement as a Regionally Important Geological Site (RIGS).
TASKS	Remove vegetation on, and in the vicinity of, the known archaeological sites. Preserve the remains of exposed, archaeologically significant, stone buildings using non-hydraulic lime mortar. To identify additional archaeological features on both reserves and excavate them, after first seeking advice from an archaeologist. To excavate the internal structure of the Warrener's Cottage. Rebuild collapsed sections of dry stone and mortared walls. Remove encroaching vegetation from important geological features. Fell trees growing on, and close to, the limestone pavement and remove most of the soil from the 'grykes'. Put up interpretation boards to explain the most significant archaeological and geological features.

TIMESCALES	Preserve the remains of the Warrener's Cottage using lime mortar before the winter of 2018. Excavate archaeological features during spring and summer. Rebuild walls (dry stone or lime mortared) during spring and summer. Clear encroaching vegetation off important geological features during spring, summer or autumn.
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Table 11 - BET Species List Summary, 2004 - 2018

Group	Taxon group	Count
Amphibians	amphibian	4
Birds	bird	43
Butterflies	insect - butterfly	25
Ferns	fern	14
Fungi etc.	fungus	71
	slime mould	3
Grasses	flowering plant	37
Insects and bugs	acarine (Acari)	6
	insect - beetle (Coleoptera)	31
	insect - booklouse (Psocoptera)	1
	insect - caddis fly (Trichoptera)	1
	insect - dragonfly (Odonata)	6
	insect - earwig (Dermaptera)	1
	insect - hymenopteran	24
	insect - lacewing (Neuroptera)	1
	insect - orthopteran	5
	insect - scorpion fly (Mecoptera)	1
	insect - silverfish (Thysanura)	1
	insect - true bug (Hemiptera)	19

	insect - true fly (Diptera)	23
	spider (Araneae)	10
	springtail (Collembola)	5
Invertebrates	annelid	4
	centipede	1
	crustacean	6
	harvestman (Opiliones)	1
	millipede	2
	mollusc	14
Lichen	lichen	7
Liverwort	liverwort	2
Mammals	terrestrial mammal	19
Mosses	moss	4
Moths	insect - moth	37
Plants	alga	1
	flowering plant	290
Reptiles	reptile	3
Trees	flowering plant	37
Grand Total		760

Figure 1 - Relation to other Green Infrastructure

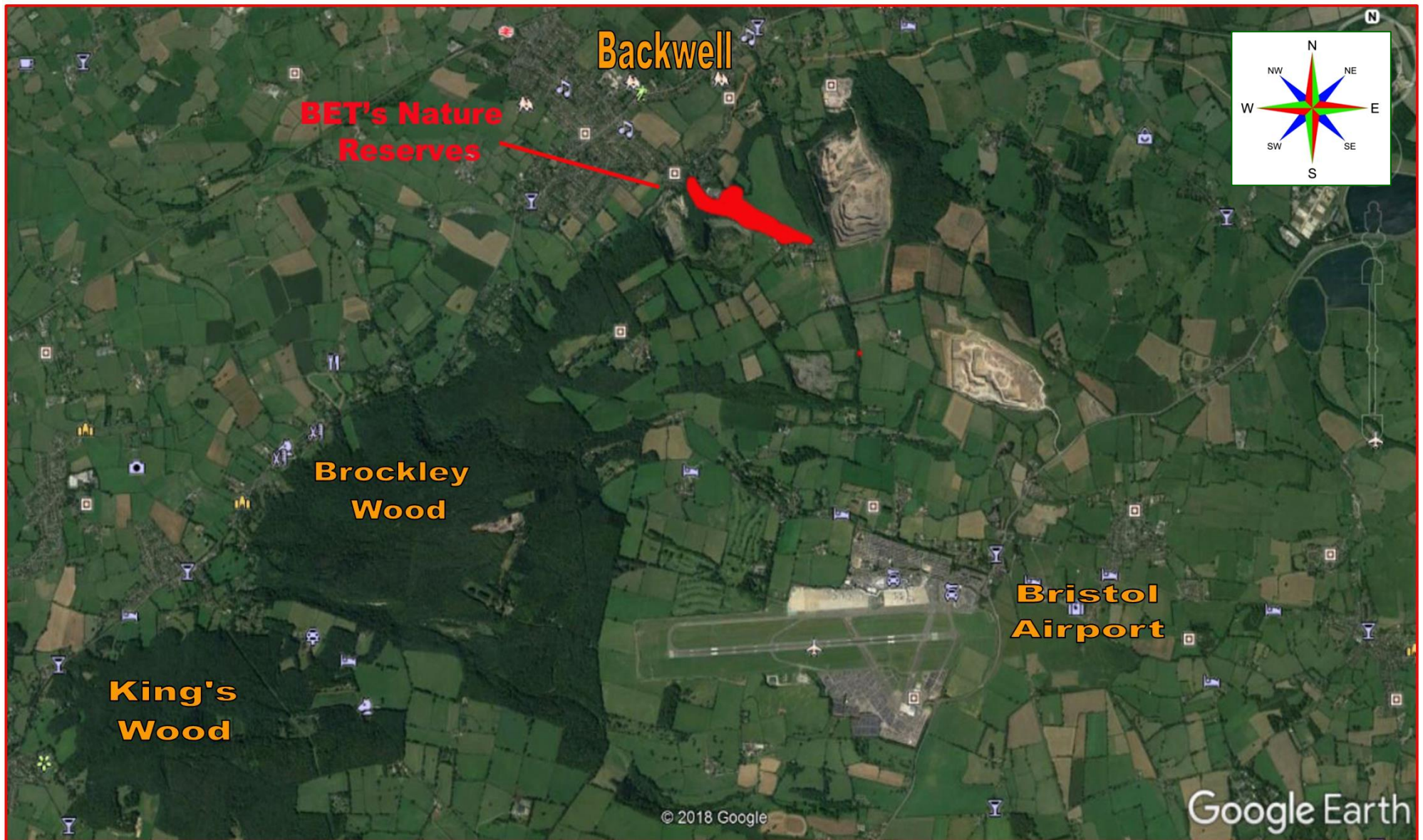


Figure 2 - BET's Nature Reserves

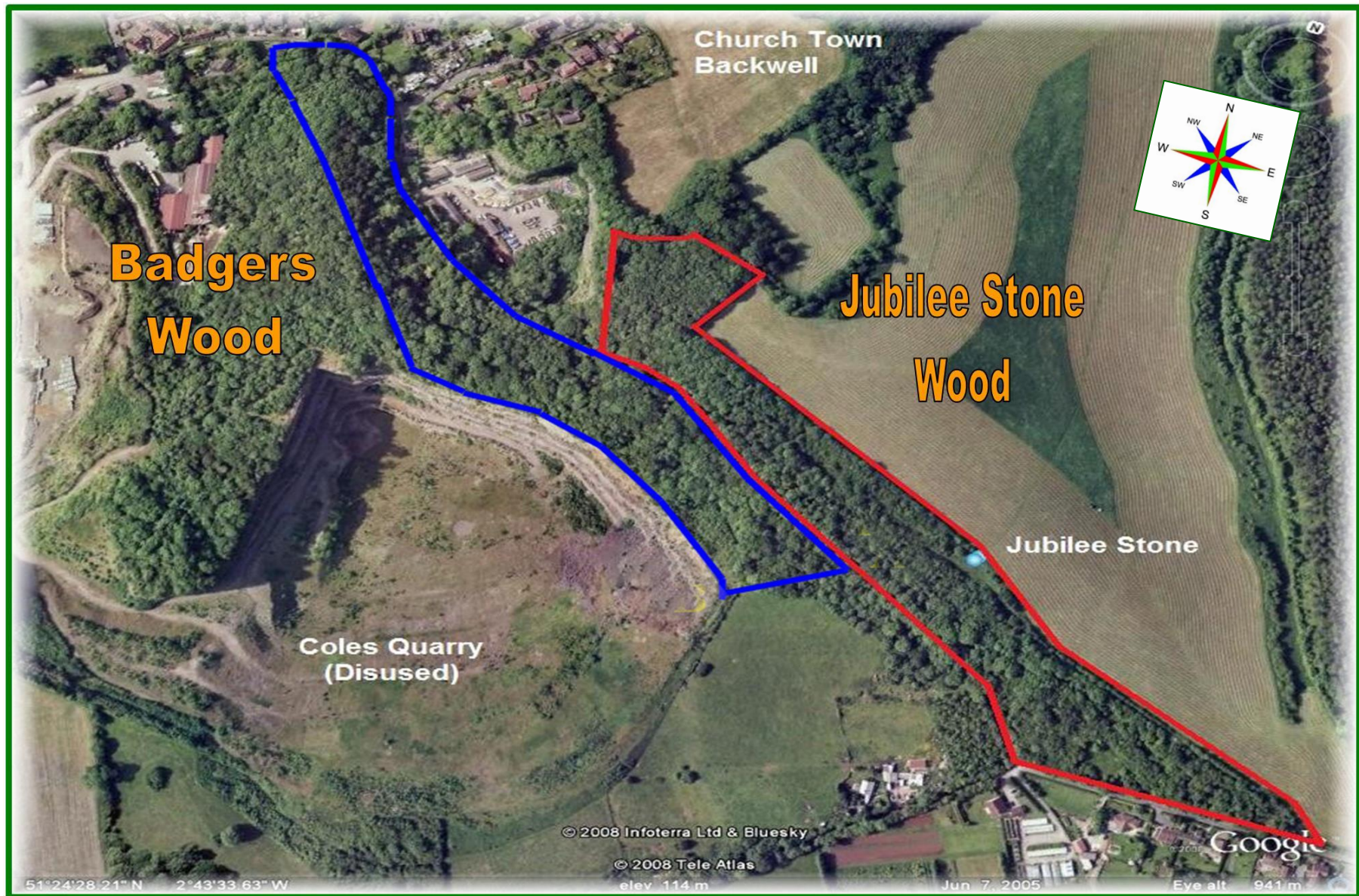


Figure 3 - Jubilee Stone Wood & Badgers Wood in 1946

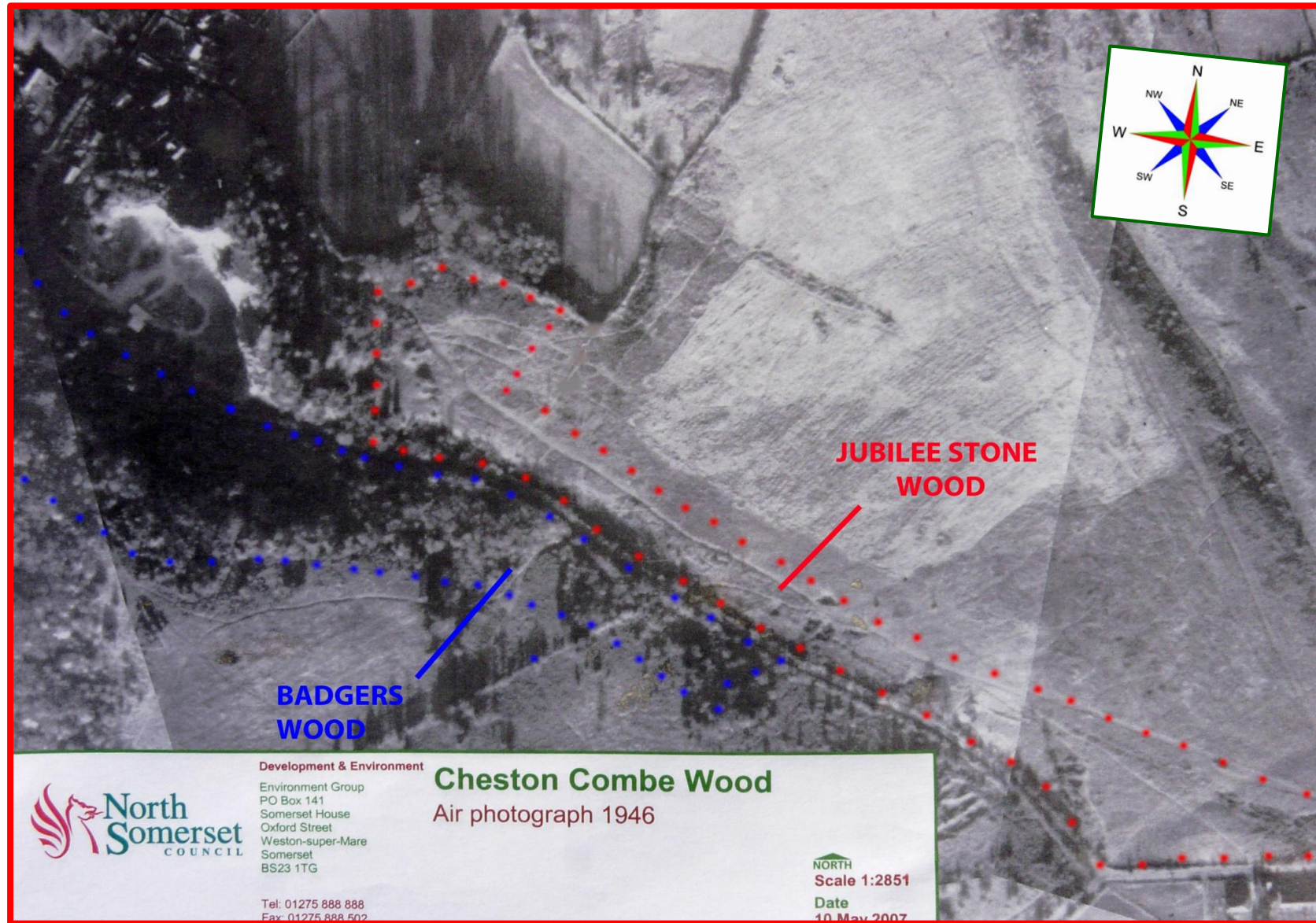


Figure 4 - Woodland Management Tasks

Jubilee Stone Wood – Compartments



Figure 5 - Woodland Management Tasks

Badgers Wood - Compartments



**Figure 6 - Jubilee Stone Wood
General Reserve Categories (2018)**



Wildflower-rich Limestone Grassland



High Density Woodland with Poor Understorey



High Density Woodland with Little or No Understorey

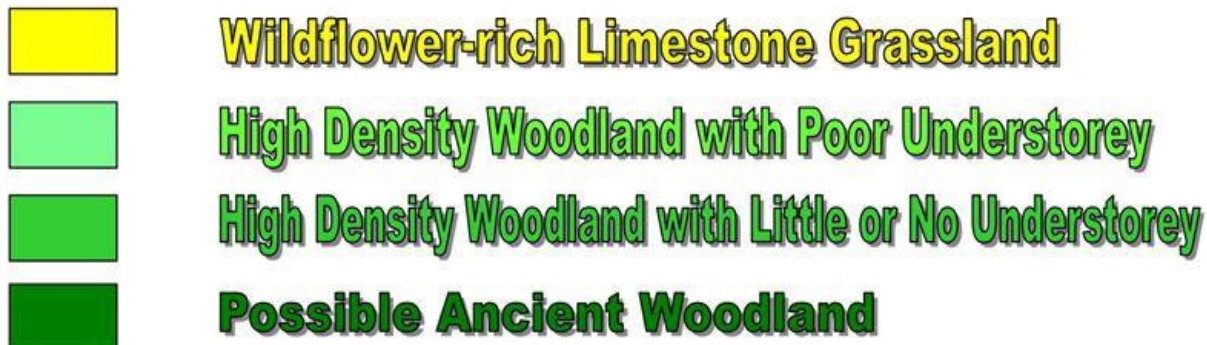
Meadows

1: Horsering

2: Jubilee Stone

3: Coupe

**Figure 7 - Badgers Wood
General Reserve Categories (2018)**



Meadows

- 1: Top**
- 2: Middle**
- 3: Lower**
- 4: Fern Way**
- 5: The Layers**