# Definition of Favourable Conservation Status for violet click beetle

Defining Favourable Conservation Status Project

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January 2023

NATURAL ENGLAND

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# Acknowledgements

We wish to thank the following for help in the production of this definition:

Keith Alexander and from Natural England Simon Curson and members of the Technical Steering Group in particular Tim Bernhard and Andy Brown.

# Executive summary

This document sets out Natural England's view on favourable conservation status for violet click beetle in England.

Favourable conservation status is the situation when the species can be regarded as thriving in England and expected to continue to thrive sustainably in the future. The definition is based on the available evidence on the ecology of violet click beetle. Favourable conservation status is defined in terms of three parameters: natural range and distribution; population; extent and quality of habitat necessary for long-term maintenance of populations.

A summary definition of favourable conservation status in England follows. Section 1 of this document describes the species and its ecosystem context, Section 2 the units used to define favourable conservation status and Section 3 describes the evidence considered when defining favourable conservation status for each of the three parameters. Section 4 sets out the conclusions on favourable values for each of the three parameters.

This document does not include any action planning, or describe actions, to achieve or maintain favourable conservation status. These will be presented separately, for example within strategy documents.

The guidance document Defining Favourable Conservation Status in England describes the Natural England approach to defining favourable conservation status.

## Summary definition of favourable conservation status

Violet click beetle *Limoniscus violaceus* is a rare, obligate wood mould click beetle which has been found at three sites in southern England. It is difficult to detect as most of the time it is found within the decaying and decayed heartwood of living, veteran ash and beech trees. The species was only added to the British beetle list in 1937.

Favourable status will require maintenance of populations at the current three known sites: Windsor Great Park and Bredon Hill and Dixton Wood in the Cotswolds. A favourable population will require an expansion of populations at each of these three sites such that at least 81 veteran trees in the high-probability class for violet click beetle are occupied across these sites.

Favourable status of the supporting habitat would be an extent of 236 ha across the three sites. Within this area there should be:

- At least 69 high-probability trees per square kilometre. High-probability trees should be within 200 m of each other.
- At least 138 medium-probability veteran trees per square kilometre within this area.

- Successive age cohorts of trees that will move into the veteran category over time.

**Table 1. Confidence levels for the favourable values**

| Favourable conservation status parameter | Favourable value | Confidence in the favourable value |
|---|---|---|
| Range and distribution | The current three known sites. | Moderate |
| Population | A total, across the three sites, of at least 81 occupied high-probability veteran trees | Low |
| Habitat | 236 ha across the three sites with at least 69 high-probability veteran trees per square kilometre, and successor cohorts of trees. | Low |

As of January 2022, based on a comparison of the favourable values with the current values, violet click beetle is not in favourable conservation status. Note, this conclusion is based solely on the information within this document and not on a formal assessment of status nor on focussed and/or comprehensive monitoring of status.

# Contents

# About the Defining Favourable Conservation Status project

Natural England's Defining Favourable Conservation Status (DFCS) project is defining the minimum threshold at which habitats and species in England can be considered to be thriving. Our Favourable Conservation Status (FCS) definitions are based on ecological evidence and the expertise of specialists.

We are doing this so we can say what good looks like and to set our aspiration for species and habitats in England, which will inform decision making and actions to achieve and sustain thriving wildlife.

We are publishing FCS definitions so that you, our partners and decision-makers can do your bit for nature, better.

As we publish more of our work, the format of our definitions may evolve, however the content will remain largely the same.

This definition has been prepared using current data and evidence. It represents Natural England's view of favourable conservation status based on the best available information at the time of production.

# 1. Species definition and ecosystem context

## 1.1 Species definition

Violet click beetle *Limoniscus violaceus* (Müller, P.W.J., 1821). There is no sub-specific variation recorded.

## 1. 2 Species status

### Red list status

An assessment of the risk of extinction.

**Global:** Endangered (Calix and others 2018).

**European:** Endangered (Calix and others 2018).

**GB:** Not assessed.

### Conservation status

A species of Principal Importance under Section 41 (S41) of the Natural Environment and Rural Communities (NERC) Act 2006.

Listed on Annex 2 of the Habitats Directive.

## 1.3 Life cycle

The life history is well described. The larvae and pupae are found only within the decayed heartwood of living veteran trees, specifically in undisturbed wood mould in the base of tree hollows or cavities.

Eggs are laid from April-June, hatching after 8 days in captive experiments. The larvae develop within composting wood mould. Larval development usually requires 15 to 16 months but in the UK it may take more than two years. The larvae feed within the decaying wood mould they are hatched in, getting nutrients from the mix of rotting wood, bird droppings, invertebrates and decayed leaf litter in the tree. The imago overwinters in a pupal chamber founded on wood mould nodules. French studies indicate an average population of 10 animals per tree, with 3 dispersing per annum. There is a sex-bias towards females for emergence. Observations on emergence are few but suggest late afternoon and early evening (Gouix 2011).

It is likely that the adults are nocturnal and that they may feed on nectar. It is believed they remain in the same trees all their lives in England, only leaving when the trees rot away and no longer provide the conditions they need for breeding.

## 1.4 Supporting habitat

This is a late successional obligate wood mould beetle utilising, in England, living ash and beech as its principal tree hosts. This is a smaller range of tree species than used elsewhere in Europe, where oak and beech are used (Gouix 2011; Gouix and others 2012). The wood mould resource is the key dependency rather than the tree species. In addition, there is no evidence to suggest that the habitat or ecosystem in which the trees grow is important for the beetles, however, it will influence the health of host trees and degree of protection from windblow.

Larval sites are typically, but not exclusively, deep basal decay hollows. Cuff and others (2021) note that the water content of occupied wood mould is higher and more stable than in non-occupied tree hollows. In a large-scale study of 191 trees, less than 20% of potential habitat trees were occupied by violet click beetle larvae (Gouix & Brustel 2011).

Wood mould features persist over decades. However, very few studies have explored the age of formation of the hollows supporting the volumes of wood mould required in the host tree species. Wesolowski (2012) looked at persistence of much smaller holes used by hole-nesting birds rather than the deep basal hollows utilised by violet click beetle. Even here he noted that holes in oak *Quercus* spp. persisted more than those in ash *Fraxinus excelsior*, and in both much more than in coniferous species, and that hole persistence increased with both living trees and those of larger girth. In his study 16.5 years persistence of these small voids was noted in oak. How relevant this is to the much larger wood mould hollow formation is unclear. Alexander and others (2015), citing the work of Ranius in Sweden, note that in English oak *Quercus robur* trees, hollow formation really only expresses itself (with 50% of the trees studied) in the age class of 200-300 years old as measured by tree ring counts, and that all 400-year-old plus trees had hollows. However, oak has a true heartwood unlike ash and beech and so hollowing progress may be very different. Sebek and others (2013) found that pollarded *Salix alba* trees produced more hollows than unpollarded trees and suggest that this practice might be key to resource provision. *Salix* has once been found to support violet click beetle at Bredon Hill SSSI. However, number of hollows may not be relevant, as most occupied trees in England relate to single large hollows in the core of tree trunks.

So, although the larval habitat feature might be long lived, and may persist for hundreds of years, new resources take a long time to become available. In addition, based on what is known for other saproxylic species, it is likely that suitable trees - new breeding resources - must be within 250 m of each other.

A useful model was developed by Gouix and others (2015) in which the basal circumference 30 cm from the ground of host trees and the decay class of the hollows were the best predictor of where violet click beetle would not be found, and then, in

probability terms, of where it would be found. The five different stages of decay in the decay class model are shown in Figure 2, Annex 1 at the end of the document.

**Table 2. Tree characterisation for a tree to be counted as a resource (tabulated, based on Gouix and others 2015).**

| Tree characteristic | Requirement | Comments |
|---|---|---|
| **Species** | Ash, beech in England | Many other species are also used in France |
| **Age** | 250+ years | Age, *per se*, is a lower predictor than basal circumference, but is a value more widely available that might identify suitable trees. |
| **Basal circumference @ 30 cm** | Average 332 cm (CI = 235-360 cm); high probability greater than 360 cm | On sloping sites, measurements are taken at 30 cm on the upslope and the tape stretched around parallel to the ground, that is, not an ellipse by cylindrical section. These are recorded as minimum values, as they exclude downslope basal buttresses. |
| **Decay class** | 5, then 4 | This only works for classic basal hollows, though violet click beetle is known to use other wood mould accumulations, often at height. Non-exterior hollows may exist, so these trees are included. |
| **Tree arrangement** | Open-grown but in proximity | Isolated trees might suffer from suggested low violet click beetle mobility. |

**Other sources:** Balaguer and others 2015.

**Confidence:** Moderate-High

## 1.5 Ecosystem context

Violet click beetle is native to central and western Europe. It has a discontinuous distribution from Estonia and Romania through Hungary, Austria, Czechia, Germany and Slovakia to France, Spain and England. It is extinct in Denmark and Poland and very rare throughout its range. It is the only species in the genus found in western Europe, though other species occur further east (*L. suturalis*, for example, from SW Russia). Japan has 22 species in the genus (Arimoto & Arimoto 2018).

England holds a very small proportion of European violet click beetles. Within the Atlantic biogeographic zone, both France and Spain hold both more trees (50-250 reported from France) and have a larger species range. The England range is approximately 10% of the range across the Atlantic biogeographic zone.

The late successional trees holding the wood mould resource also support a saproxylic fauna, including several other rare invertebrates. Emergence trapping at Bredon in 2015, for example, yielded the click beetles *Ischnodes sanguinicollis* (IUCN Vulnerable in Europe) and *Procraerus tibialis* (Nationally Rare) and the extremely rare false click beetle *Eucnemis capucina* (RDB1). Environmental DNA (eDNA) may allow a full characterisation of this assemblage, but initial attempts in 2017 and 2018 using samples from Bredon, Dixton and Windsor were unsuccessful.

Gouix (2011) notes co-occurrence with *Ischnodes sanguinicollis* as well as with *Cardiophorus gramineus* (Near Threatened in Europe), another click beetle now considered extinct in the UK. The last record of that species was from 1860 near Monmouth. Sebek and others (2013), in a study in the Czech Republic of emergence catches from 73 basal hollows, listed 25 saproxylic taxa which were positively associated with violet click beetle occupation. This included the click beetles *Ischnodes sanguinicollis* and *Procraerus tibialis*, as found at Bredon. Straka (2015) used 8.5 cm plastic flowerpots buried 5-10 cm into the wood mould resource, enhanced with 5-7 pieces of dry cat food between March-June. This technique recovered violet click beetle*, Ischnodes sanguinicollis* and larvae of the click beetle *Elater ferrugineus* (Near Threatened in Europe). One third of the 12 trees held violet click beetle larvae, the tree species being beech and one oak.

# 2. Units

## 2.1 Natural range and distribution

Number of sites, given the strong reliance on stands of high-probability trees in proximity.

## 2.2 Population

Occupied trees at known sites.

The larvae and their supporting wood mould habitat are obligately tied to late maturity trees as defined by the probability model. High-probability trees are those with a circumference at 30 cm above ground greater than 360 cm and in decay classes 4 or 5.

## 2.3 Habitat for the species

Hectare.

This is the extent of areas with at least 69 high-probability veteran trees per square kilometre, within 200 m spacings, good numbers of medium-probability veteran trees and successive age cohorts of non-veteran trees that will move into the veteran category over time.

# 3. Evidence

## 3.1 Current situation

### Natural range and distribution

There are three known occupied sites: Windsor Great Park and Bredon Hill and Dixton Wood in the Cotswolds. However, the adults of this species are hard to detect, and finding larvae usually means disturbing the larval substrate. eDNA work has so far failed to be able to detect the species. The use of the bait luring method (Straka 2015) in England is at an early stage but has successfully added a new larval tree, has demonstrated multi-age class occupation in larval substrate, and has much reduced disturbance of larval habitat substrate layering.

It is conceivable that Dixton is a satellite site of Bredon as it is only approximately 10 km from it, and Bredon has long been viewed as a Cotswolds geological outlier. Windsor is certainly isolated from the other two populations.

**Confidence:** Moderate

### Population

Disruptive substrate searching suggests that just 19 trees are occupied by this species in England, though the fact that high-level rot pockets and wood mould inaccessible to humans are used by the beetles means that the number of occupied trees is likely to be more than this.

Emergence trapping (following the techniques of Gouix and others) at Bredon Hill failed to locate violet click beetle despite locating several other rare click beetles. Both pheromone and eDNA techniques, which would give us a greater understanding of the utilised tree resource, are in the early stages of development. Cuff and others (2021) have explored volatile organic compounds at Windsor from occupied trees and have identified several which are distinct.

Testing the validity of the occupation model might eventually be through eDNA analysis or bait luring. Unpublished bait luring data from 2021 shows that two high-probability trees at Bredon NNR do hold violet click beetle larvae. The two trees are in the early stages of development, about 84 m apart.

Assessment by tree probability class is now the favoured technique, because of its non-invasive nature, but this can be augmented by bait luring as this both proves larval presence and has very low impact on the larval habitat resource.

**Confidence:** Low, as number of known occupied trees is based on classic sampling, typically involving disruption to larval habitat. A failure to find beetles cannot necessarily be taken to indicate true absence and high-probability trees may not be occupied.

## Habitat for the species

The species requires aggregations of veteran trees, with good numbers of high and medium probability veteran trees, and successive age-cohorts of trees that will move into the veteran category over time. Medium probability veteran trees are those that are in the size or decay class below high-probability veteran trees or where the decay class is not visible. Cohorts of each tree probability class (medium/medium-high & high) need to be present at a ratio of 2:1 to ensure continuity.

The current areas of the three sites are as follows:

- Windsor - key unit area =126.7 ha.
- Bredon - key unit areas summed = 96 ha.
- Dixton Wood - whole site =13.1 ha.

However, it is not clear that the full extent of these areas form suitable habitat. Comprehensive data on the number of suitable trees across the three sites, and age cohort gap analyses, are currently not available. If the type of age class by species analysis were available, then the trend in available habitat might be better understood. The key tree cohorts are those moving into the 200-300-year-old age class. There may be some advantage for these sites as both ash and beech seem to decay faster than the 200-300-year trajectory for hollowing oak.

Information on tree age obtained by measurement of mature ash at Bredon already exists. There is also an active programme to obtain more measurements with the view to producing an occupation probability map. Smaller scale work has taken place at Dixton, but Windsor appears less well surveyed. Bredon alone, on incomplete assessments, has 34 high-probability trees, with 29 medium-probability trees (as of July 2021).

**Table 3. High-probability and medium-probability trees at known sites**

| Site | High-probability tree number | Medium-probability tree number | Comments |
|---|---|---|---|
| Windsor High Standing Hill | 5 (breeding records from 6 others), so suggests 11 trees | 13 | Some probability mapping has taken place at High Standing Hill, though the rest of the park remains un-assessed using this particular technique. |
| Bredon Hill SAC | 34+ | 29+ | But only a fraction of the large SSSI surveyed |
| Dixton Wood SAC | 1 (+original tree) | 13 | But lower wood not yet surveyed |

**Confidence:** Low-Moderate

## 3.2 Historical variation in the above parameters

The species was added to the British beetle list after a specimen was found at Windsor Great Park in 1937. The species was found at Bredon Hill in 1991 and at Dixton Wood in 1998. Targeted searches in the vicinity of each of the known populations in the early 2000s have not located further individuals. The locations searched are shown as points on the map at Figure 3, Annex 2.

### Natural range and distribution

It is probable that violet click beetle formerly occurred in other parklands or Royal Forests with concentrations of veteran trees but there is no evidence to that effect. Figure 1 details the likely extent of Royal Forest parks between 1327 and1336. It encompasses the current three sites, as well as highlighting the historic extensive resource within the area between Bredon and Windsor.

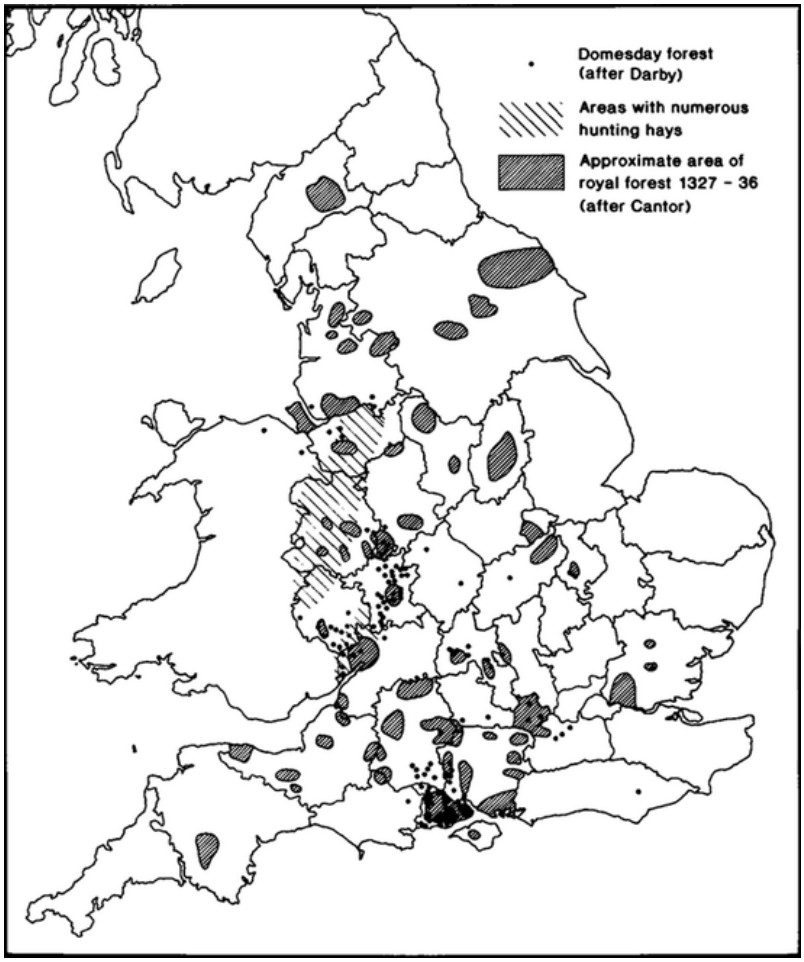


**Figure 1. Approximate extent of Royal Forest 1327-1336. From Hooke 2011**.

**Confidence:** Low

### Population

Other than relatively unstructured recording of larvae, or odd encounters with adults, there is no meaningful understanding of population change.

**Confidence:** Low

### Habitat for the species

Similarly, there is no evidence of how the tree resource available to violet click beetle may have changed over time.

At Bredon, part of the tree resource was cleared some decades ago, impoverishing the saproxylic invertebrate assemblage. There have been some losses of veteran trees at Windsor (though this has large numbers of such trees) and some at Dixton Wood. The losses are, on the whole, down to wind-throw, though remedial tree surgery at both Dixton and Bredon over the last 20 years has resulted in greater structural integrity of the trees. What is less clear is the number of high-probability trees and how that may have changed over time.

Most, but not all, violet click beetle trees mapped out by Whitehead (between 1998 and 2002) have been re-found, re-mapped and characterised. However, re-finding the trees does not prove that the larvae are present but shows some stability in the availability of the presumed larval resource.

**Sources:** Whitehead 2000 (unpublished); Anton Irving; David Heaver.

**Confidence:** Low - Moderate.

## 3.3 Future maintenance of biological diversity and variation of the species

The beetle's range and numbers are heavily constrained by its larval habitat resource. There seems to be a critical lack of trees in the age class and basal circumference profiles thought to ensure long-term survival for this species, especially given the disease threats (such as ash die-back) which may further diminish the tree resource. To ensure the future of the species, an increase in the number of trees in the key age and basal circumference classes present across the range, and successor cohorts of trees, is necessary.

It is unclear what impacts climate change will have on this species. Its range across Europe covers many climate zones suggesting detrimental climate change impacts may be unlikely. The species may be partly buffered by the larval sites and their semi-subterranean existence. However, one of the likely outcomes of climate change is increased storminess, placing greater risks on the most ancient trees.

## Natural range and distribution

The area between the Cotswolds scarp and Windsor Great Park includes the saproxylic-rich Thames and Chilterns parklands which, though having no records of this species, appear to have a tree resource suitable for the species. A crude estimate of the number of veteran and ancient ash and beech trees within this area (as recorded on the Woodland Trust's Ancient Tree Inventory) is of 2,180 trees. However, it is not known what proportion of these trees might fall into the high-probability class nor is there information on the distance between trees, which clearly affects the probability with which trees are colonised. Furthermore, searches in woods on the Cotswolds scarp near to Dixton Wood, elsewhere in Windsor Great Park and in Burnham Beeches have not located the species.

Although little targeted investigation has been carried out for this species outside the three known sites, there is little expectation of finding the species. Therefore, based on what is known, the natural range and distribution is the current three sites. The current range would be adequate for the species in England if the number of suitable trees were higher.

**Confidence:** Moderate, as the techniques for detection need to be more robust.

## Population

To ensure future maintenance of populations, and increased resilience against future change and stochastic events, an increase in the population is required for favourable status. The current English population, considered in the terms of known occupied individual trees and declared as 19, is far from adequate.

There is no information available on what may be a favourable population for violet click beetle. Modelled data from European radio-tracked hermit beetles *Osmoderma eremita* (Ranius, Johansson & Fahrig 2011) indicate that 69 hollow oaks/km$^2$ within a 192 m radius are needed to obtain a probability of presence of at least 50% in a suitable tree and allow population spread and connectivity. *Osmoderma* is relatively sedentary and perhaps a reasonable model for violet click beetle.

Using the 69 *Osmoderma* hollow oak/km$^2$ values (equivalent to some 8 trees in an 11.5 ha circle) as a model for violet click beetle, and summing the key SSSI unit area figures, suggests that a total of 162 high-probability trees with an occupancy of 50% would give a favourable population of 81 trees. This partitions to 44 of 87 trees at Windsor (key unit area=126.7 ha), 33 of 66 trees at Bredon (key unit areas summed = 96 ha), and 4 of 9 trees at Dixton Wood (whole site =13.1 ha).

**Confidence:** Moderate

## Habitat for the species

A greater number of high-probability trees is required at each site to give 162 high-probability trees for favourable status. The current information (Table 3) shows that there is a capacity gap - a need for additional high-probability trees – as follows:

- Windsor - 76.
- Bredon - 32.
- Dixton Wood - 7.

162 high-probability trees present across the range will also need successive cohorts of trees moving towards and into the required age ranges across all three sites. There should be at least double that density of medium-probability veteran trees to move into the high-probability class. Both ash and beech seem to produce basal hollows more readily than oak so this figure may be higher than it needs to be (Maskell and others 2013).

**Confidence:** Low-Moderate, given that current 30 cm basal circumference work is extending the resource.

## 3.4 Constraints to expansion or restoration

The key to the maintenance of existing populations of violet click beetle, and an expansion in those populations, is to ensure that there is enough suitable tree habitat. No population re-enforcement is possible either between sites or from the near continent so the population must rely on having enough members and enough larval resource. An increase in the habitat would benefit other rare saproxylic species.

It is unclear when the wood mould forms and how much is required by the beetles, and how strong the successional tree cohorts are to replace the known tree resource. One estimated volume measurement from a known *Limoniscus* tree at Bredon hill NNR yielded an elliptic cone volume of 73.1 litres within a basal hollow 86 cm front to back and with substrate depths ranging from 18 cm to 46 cm (Heaver, *pers obs*).

Proper understanding of the total tree resource is very important, since the issue is any gap forming in the age cohort. Understanding where the trees are and how many trees are moving into the 200-300-year-old age classes, as well as the numbers within that class moving towards veterans, and how many of those veterans fall into the correct basal circumference and decay class zones, is vital. Given these timescales, planting has only very long-term usefulness. There are key information gaps at all three sites, with a lack of bespoke growth tables for the trees of interest limiting the accuracy of the age calculations.

Attempts at creating artificial wood mould piles have had limited success, meaning that the core resource remains both rare and potentially diminishing. Some work has been carried out using “artificial” structures such as boxes and bins, with hollow tree lengths being deployed at Windsor Great Park. At Bredon and Windsor the resultant fauna in the bins was characterised more by a generalist organic debris community than a high-value wood mould one, a consequence of the substrate being too dry. Jansson and others (2009) utilised forty-eight 70 litre oak boxes in Sweden, filling them with a range of organic substrates and placing them 4 m up on trees of varying ages. As their paper notes “The number of saproxylic beetle species, the total number of beetle specimens and the number of specimens per box/tree were lower than for natural cavities in the oaks. Among

beetles found in hollow oaks that were either tree-hollow species, nest species, or wood rot species, 70% were found in the boxes". They note that it is quite likely that some species will never occupy such structures, as the fungal communities are quite dissimilar. Violet click beetle did not feature in their species pool. However, the technique has potential and would overcome the age class issue where the veteran trees fail and the mature cohort behind them might not have developed enough to provide the correct decay classes. Current research by Skipp on the deployment of partially buried wood mould boxes at Bredon and Windsor has potential to bridge the age-class gap within the native trees.

Novel techniques such as characterisation of fungal communities and subsequent inoculation and management of mature trees might be tried to accelerate the development of high-probability veteran trees.

Whilst not restoration as such, recent tree surgery works, centred on halo thinning hawthorn scrub to increase solar insolation levels to the veteran trees, and crown reduction to re-balance and centre the trees, is aimed at sustaining the tree resource. The work programme at Bredon Hill NNR follows the developing violet click beetle probability map to identify the trees in need.

The area between the Cotswolds scarp and Windsor Great Park includes the saproxylic-rich Thames and Chilterns parklands which, though having no records of this species, appear to have a tree resource which might support a population should one be introduced. However, much characterisation of the larval habitat needs to take place, and there are real issues in getting enough individuals to establish a sufficient founder population from the England sites, if any translocation were to be considered. There is likely to be resistance from other European population centres if approaches were made to take species for translocation, as it remains highly threatened across its range. There do not seem to be any issues around asynchrony as the adults may well be short-lived and only questionably feed. There is no literature on any translocation attempts.

**Sources:** Alexander 2016; Royal Holloway College 2010.

**Confidence:** Moderate

# 4. Conclusions

## 4.1 Favourable range and distribution

The natural range of this species remains enigmatic, since it was only added to the GB list in 1937 and so lacks historical context. Based on what is known, the favourable range is the current range – three sites.

## 4.2 Favourable population

Based on the modelling above, using very limited data, the favourable population is occupation of 81 high-probability veteran trees.

## 4.3 Favourable supporting habitat

236 ha across the three sites with at least 69 high-probability trees per square kilometre, within 200 m spacings, plus at least double that density of medium-probability veteran trees and successive age cohorts of trees that will move into the veteran category over time.

The tree resource could be monitored by application of the tree characterisation technique described above.

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# Annex 1 Tree decay class

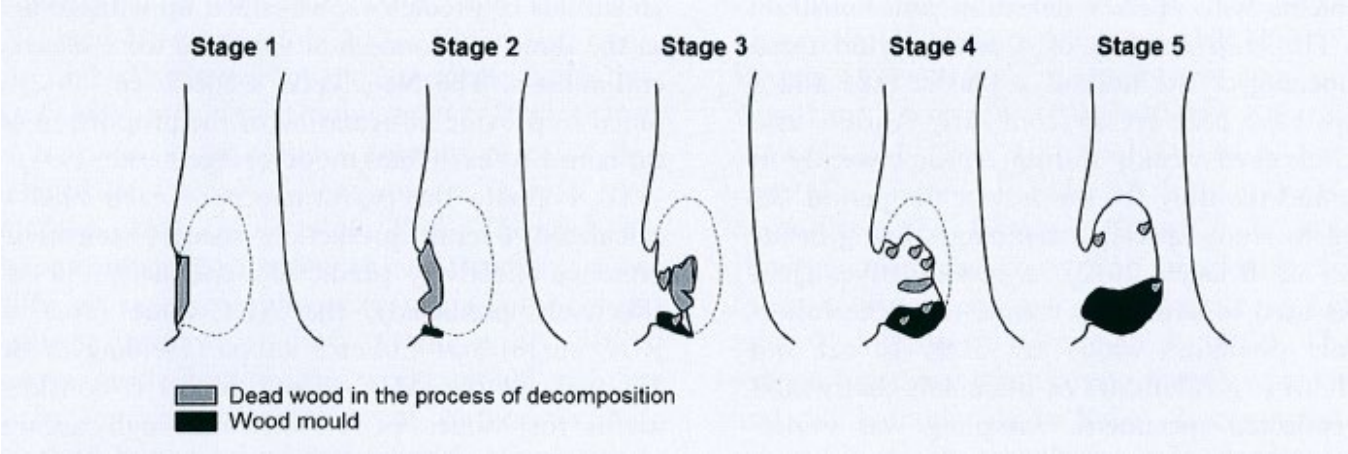


**Figure 2. Decay class characterisation of basal hollows, after Gouix and others 2015**

**Image 1. Decay class 4, in Tree 34, a known violet click beetle tree at Bredon Hill NNR. (Photo: © D. Heaver)**

# Annex 2 Cotswold sites searched for violet click beetle

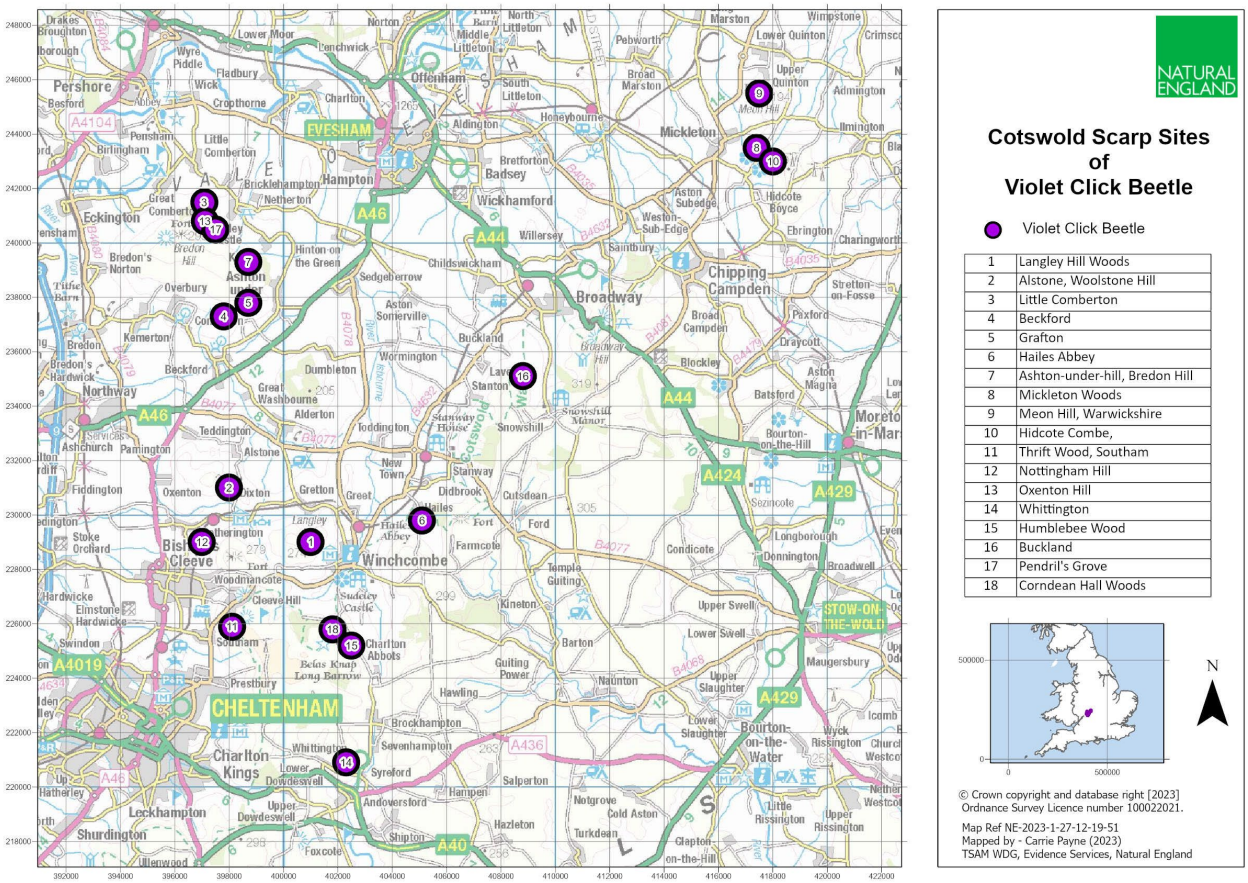


**Figure 3. Cotswold scarp sites searched for violet click beetle, 1999-200 © Crown Copyright and database right 2023. By using this data you are accepting the terms of the Open Government Licence (Open Government Licence (nationalarchives.gov.uk)). For further info contact Natural England 0300 060 3900 enquiries@naturalengland.org.uk .**

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Natural England is here to secure a healthy natural environment for people to enjoy, where wildlife is protected and England's traditional landscapes are safeguarded for future generations.

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## Citation

David Heaver. 2023. Definition of Favourable Conservation Status for violet click beetle. RP2966. Natural England.

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Cover image: Violet Click beetle (adult), Roger Key, Natural England, (1995).

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Catalogue code: RP2966

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