

# Managing wood mould habitats using the Violet click beetle as a case study



The Windsor population is considered the larger of the two known populations. The importance of all three sites for the species is reflected in their designations as Special Areas of Conservation (SAC) under European legislation.

## What does it need?

The larvae of the Violet click beetle develop in the richly organic accumulations of moist, compacted, black wood mould found in hollowing trees. Wood mould itself is the composted woody debris that develops at the base of tree hollows during heartwood decay through the combined actions of wood-decay fungi and saproxylic invertebrates. Large accumulations of wood mould are restricted to trees in the most advanced stages of heartwood decay, particularly those more than 200 years old.

## What is it and why is it important?

The Violet click beetle (*Limoniscus violaceus*) is one of our rarest insects and is classified as Endangered (second highest threat category) on the European Red List. It is also one of our most protected species both at European and domestic levels. The preferred habitat of the Violet click beetle is shared by a number of other specialist saproxylic (decaying wood) species, many of which are also under threat. By managing and protecting habitat for Violet click beetle we are also helping secure the future for these other species too.



## Where is it found?

The species is currently only found at Windsor Forest (Berkshire) and Bredon Hill (Worcestershire), although there is also a single larval record from a third location close to the Bredon Hill site (Dixton Wood, Gloucestershire).

The Violet click beetle is most often associated with wood mould at or below ground level (so called basal hollows), particularly where it has started to mix with the soil but has on occasion

also been found in hollows higher up the trunk. The complexity of microhabitats found within hollowing trees means they often play host to a wide variety of other animal species (e.g. birds) that contribute further to the organic content of the wood mould substrate through their nesting materials, droppings, prey remains and even corpses. It is thought these additional organic inputs may be crucial for Violet click beetle larval development.

Depending on the quality of the wood mould, larval development may take up to 2 years, and appears to be sensitive to levels of humidity. Dry wood moulds are considered less suitable for this species, possibly because they favour other (predaceous) insects. Tree hollows that are surrounded by a thick wall of intact woody tissue provide the most stable conditions for larval development by buffering the wood mould against rapid external changes in moisture and temperature.

In the UK, the Violet click beetle is mainly associated with veteran trees in active, defunct or remnant wood pasture as well as trees formerly in a regular coppice or pollard management cycle. Tree species is thought to be less important than the quality of the substrate and stage of decay. At Windsor, the beetle is associated with veteran Beech trees in a high forest setting, while at Bredon Hill/Dixton Wood the beetle is associated mostly with veteran Ash (including former pollards) in open-grown or woodland edge/hedgerow settings.



Violet click beetles, like other insects associated with tree hollows, are probably poor dispersers. Evidence from the Windsor population suggests that individual trees can support colonies of the beetle for decades and so dispersal may only occur when the habitat is no longer suitable through direct loss of the tree or exposure of the wood mould substrate to the elements. The limited availability of suitable habitat in the wider landscape may have also selected against individuals that disperse widely.



### What are the main threats it faces?

The Violet click beetle requires the continuous presence of hollowing veteran trees in a landscape. To date, Violet click beetle has only been recorded from around 25 trees across all three known sites. The natural or deliberate loss of hollowing trees is the greatest threat the beetle faces, particularly where replacement trees are not available. The sparsity of suitable trees in a landscape, combined with the beetle's poor dispersal abilities, may mean it is difficult to recolonise an area once it has been lost, or indeed prevent it colonising suitable habitat away from its current strongholds.

Veteran trees are under threat from a wide range of factors including under-management, intensive land use practices, tree diseases and climate change. For example, cessation of traditional management such as pollarding has left many veterans at risk of collapse due to top heavy crowns (e.g. lapsed pollards). Elsewhere, canopy closure through lack of grazing can lead to veteran

trees being shaded out by younger trees leading to premature death. Intensive activity around the roots of veteran trees, such as heavy grazing, ploughing, chemical spraying and visitor footfall can lead to direct damage of roots and soil compaction, as well as disrupting the vital mycorrhizal (fungal) associations that help sustain trees. Meanwhile, the arrival of novel pathogens and warmer, drier summers may mean that some tree species are no longer able to reach the age at which wood mould and other late stage decay habitats develop.

### What can you do to help?

The aim of the following management advice is to ensure the long-term continuity and connectivity of wood mould habitat across a landscape through the provision and protection of veteran trees. Management interventions are broadly grouped into three areas namely; a) maintaining existing veteran trees, b) providing a continuity of replacement trees into the future, and c) providing interim measures to help plug existing gaps in the tree age structure.

#### a) Maintaining existing veteran trees

Existing veteran trees (both dead and alive) including in-field and hedgerow trees have had centuries to develop suitable decay conditions and represent the best hope in the short-medium term for Violet click beetle populations. Protecting and managing such trees to prolong their lifespan is the highest priority action you can take for this species. Any management work required should be directed initially at those trees considered to have high or medium suitability as Violet click beetle habitat (see Box 1 for definitions of habitat suitability).

Management options include direct tree surgery to reduce risks of collapse or indirect management of surrounding trees to reduce competition. Examples of indirect management include gradually removing younger trees within 5-10m of the circumference of the canopy (halo thinning) or selectively removing sections of older trees where they overtop or otherwise outcompete a veteran trees canopy (high-canopy competition). Note that direct work on a veteran tree should only be

undertaken as a last resort where there is a genuine risk of harm to the tree if it were otherwise left alone (e.g. lapsed pollard in danger of collapse). Where trees are known to hold Violet click beetle, any direct tree work that is likely to lead to disturbance of the wood mould habitat within, would require a disturbance licence from Natural England (for further advice contact your local NE officer).



Direct management of veteran trees should also be carefully considered given the potential risk of increased susceptibility to tree diseases (e.g. Oak mildew and Ash dieback). For example, young Ash trees and fresh coppice growth are the most susceptible to Ash dieback and can rapidly lead to tree death but re-growth in response to surgery on older trees may also be susceptible. The risk of increased susceptibility to ash dieback should be balanced against the risk of losing a veteran Ash tree through no action.

Ensure that the ecological importance of individual veteran trees as decaying wood habitat is taken into account when making decisions around tree safety management. For example, consider removing or re-routing visitor infrastructure that falls within the root protection area of high and medium suitability trees. The root protection area of veteran trees is defined as a radius 15 times the diameter at breast height (DBH).

Fallen timber, especially large diameter pieces, is equally valuable for saproxylic species, and the Violet click beetle has been recorded using horizontal pieces of timber on at least one

occasion. Resist the urge to tidy away any fallen deadwood or remove standing dead veteran trees on site. If fallen deadwood must be moved for Health and Safety purposes then minimise distance moved and keep as intact as possible to retain integrity of any habitats within. Standing dead trees can continue to provide vital decaying wood habitat for decades and should never be removed. Consider all alternative options before felling.

Where basal hollows containing wood mould habitat have become exposed to the elements and are being disturbed by animal incursions, consider blocking access to the cavity using, for example, chicken wire. If the tree is already known to host Violet click beetle (both now or in the recent past) then a licence will be required from Natural England before work commences.

General advice on best practice veteran tree management can be found on the publications page of the Ancient Tree Forum website ([www.ancienttreeforum.co.uk](http://www.ancienttreeforum.co.uk)). For more specialist advice on the management of individual veteran trees seek a qualified tree surgeon (ARB approved contractor or ISA certified arborist) or qualified professional consultant with proven veteran tree experience. The Arboricultural Association website ([www.trees.org.uk](http://www.trees.org.uk)) provides a directory of suitably qualified arborists. A new European-wide certification scheme (VETcert) is now in place which will further identify arborists and professional consultants with the specialist knowledge required to advise and carry out veteran tree work.

- b) Providing a continuity of replacement trees into the future

Continue/reintroduce traditional management activities such as pollarding that help accelerate the development of decay features. Beech and Ash may take upwards of 200 years to develop extensive areas of heartwood decay. Trees that are pollarded have been shown to develop hollows at a much earlier age than their maiden counterparts.

Plant trees or allow natural regeneration where the next generation of trees are lacking.

**Box 1: Violet Click Beetle habitat suitability assessment**

Work in France suggests the beetles prefer large trees (at least 3.6m in girth when measured 30cm above the ground) and those that are in their final stages of decay (see Stage 5 in diagram below). Using these two simple visible measures allows veteran trees on a site to be quickly assessed for their habitat suitability using the threshold values in the table below.

Mapping the location of trees with high and medium suitability will help identify priority trees for protection/management as well as identifying gaps in the spatial distribution of available habitat

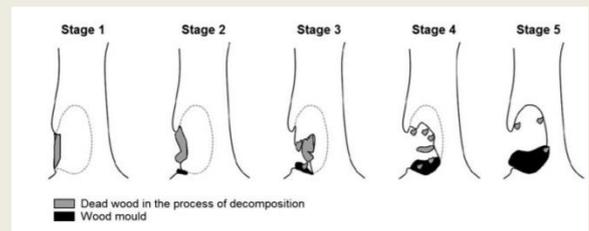
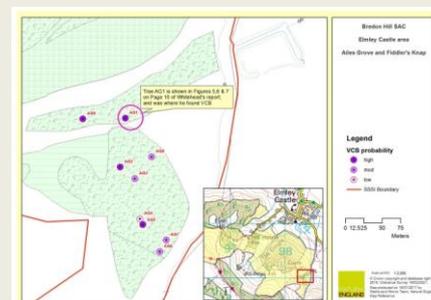


Illustration of decay stages in progression of hollow development

Habitat suitability (low-high)		Decay stage of hollow		
		1-2	3-4	5
Tree circumference measured low to ground	<2.35m	Low	Low	Med
	2.35-3.60m	Low	Low-Med	Med
	>3.60m	Low	Med	<b>High</b>

Table of habitat suitability thresholds



Example of habitat suitability mapping

Establishing new trees which will persist for hundreds of years can help connect known breeding sites or nearby sites with similar suitable habitat. Historic maps such as the 1<sup>st</sup> Edition (25in) Ordnance Survey series can identify previous landscape connections in the form of lost features such as hedgerow or in-field trees. Open grown trees or isolated trees in hedgerows will provide the best future potential as they are likely to live for longer than trees growing in closed canopy woodland, in the absence of direct competitors.

The future of Ash in the UK is uncertain following the arrival of Ash dieback (*Chalara*). Young Ash trees are very susceptible to the disease and can die rapidly and young growth on mature trees is equally vulnerable. The best hope for Ash in the UK is to find natural resistance genes in the UK Ash population. While planting young Ash trees is not advised at the current time, allowing natural Ash regeneration to grow will ensure resistance genes have the opportunity to be expressed and passed on to future generations. On sites where Ash predominates consider using alternative native/naturalised tree species that fill a similar ecological niche such as Field maple or Sycamore. Further advice on alternative tree species to Ash can be found on the Forestry Commission website ([www.forestry.gov.uk/england](http://www.forestry.gov.uk/england)) or by consulting your local Natural England officer.

- c) Providing interim measures to help plug existing gaps in tree age structure

While tree planting may provide a long-term solution to the risk of losing an existing veteran tree resource, or plugging a gap in the age structure, it will take many decades, possibly even a century or two for such trees to reach a point where they provide suitable wood mould habitat. In the interim, there is a risk that existing veteran trees will be lost prior to the younger generation reaching the stage at which they will replace them. In such scenarios, one of the following options should be considered to plug any immediate short-medium term gaps in the existing resource. Note that these methods should only be seen as a stop-gap measure and not a long-term solution to the plight of the Violet click beetle.

Short term measures: Where there are large age gaps in the availability of replacement high suitability habitat (e.g. 200 years plus) consider deploying sunken “beetle boxes” as interim habitat. These boxes are designed to mimic the ecological needs of the beetle in a targeted way using artificial substrates. “Beetle boxes” should ideally be situated within close-proximity (<50m) of existing high suitability trees to increase chances of colonisation.

**Box 2: Artificial habitats**

Research in Scandinavia has shown that wooden boxes filled with artificial wood decay substrates and deployed above ground can attract saproxylic species associated with hollow trees within 10 years. The basic artificial substrate consisted of a mix of wood shavings, oats, water and leaf litter, with additional materials added to some boxes including potatoes and dead chickens. Over time these boxes lose their attraction unless the artificial substrate is regularly replenished (3-5-year cycle). Similar methods were trialled at both Bredon Hill and Windsor using partially sunken refuse bins filled with an artificial substrate but had mixed results. Research initiated in 2019 will ascertain whether wooden boxes sunken partly underground can also attract species associated with basal hollows such as the Violet click beetle.

At Windsor a number of sections of fallen old hollow beech trees were also re-erected onto younger trees nearby and filled with artificial substrate as above. While fallen trees decompose quicker than standing trees and undergo a different process of decay due to their contact with the ground, it is considered better practice to leave such trees intact on the ground as the hollow, and any contents it may contain, could already play host to important species such as Violet click beetle and will in all likelihood continue to do so for the short-medium term.

Medium-long term measures: It is well known that traditional management interventions such as pollarding can lead to the development of

hollowing heartwood decay at a much earlier stage of a tree's life than on unmanaged trees. The term "veteranisation" has been used to describe any form of management on a tree that is designed to initiate and accelerate the development of wood decay processes through exposing the underlying heartwood to the air. Examples that may aid development of basal hollows include mimicking "horse kicks", by removing or damaging the bark around the base of a tree, or hollowing out the base to mimic damage caused by basal rot fungi such as the Oak bracket (*Inonotus dryadeus*).



Before undertaking such work it is best to map the distribution of high, medium and low suitability trees to help identify gaps in the network of available habitat and highlight potential places to create new habitat for the future (see Box 1). Trees with existing low potential could be targeted for veteranisation, but ensure that others are allowed to age naturally.

### How can you monitor your site for the species?

The Violet click beetle and its habitat are protected under Schedule 5 of the Wildlife & Countryside Act (1981). Under the act it is an offence to collect specimens at any stage of development (including larvae) or disturb/damage trees where it is known to occur without a licence from Natural England. Any monitoring undertaken should be through indirect techniques, given the importance of the substrate for this species and the risk of mixing distinct soil horizons which may harbour unique humidity/nutritional profiles.

The best method available for landowners and site managers is to simply monitor the availability of trees based on their suitability index (high, medium or low; see Box 1 for details). Such assessments could be made as part of tree safety monitoring or as bespoke surveys.

Adults are thought to be crepuscular and active on warm evenings before dusk from mid-April to end June. Searching potential/known breeding trees by torch at dusk for emerging adults on warm evenings may yield results. Provided the wood mould is not disturbed during this process no licence is required. Alternatively, tapping branches of Hawthorn blossom with a stick over a white sheet after dark in May could reveal feeding adults. A disturbance licence would be required.

The presence of other basal hollow specialists can also indicate the availability of suitable habitat nearby. The Red collared click beetle (*Ischnodes sanguinicollis*) inhabits similar habitats to the Violet click beetle but is tolerant of a wider range of humidity preferring slightly drier substrates on average. Other click beetle species regularly recorded in the same basal hollows include *Ampedus rufipennis*, *Elaterrugineus*, *Procraterus tibialis* and *Megapenthes lugens* alongside the darkling beetles *Pseudocistela ceramoides*, *Prionychus ater* and *Prionychus melanarius*.



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Red horned cardinal click beetle (*Ampedus rufipennis*)

The Back from the Brink Ancients of the Future project is led by Buglife in partnership with Plantlife and the Bat Conservation Trust.

