

**The distribution and population sizes of the rare  
English endemic *Sorbus wilmottiana* E. F. Warburg,  
Wilmott's Whitebeam (Rosaceae)**

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ABSTRACT

The distribution of the rare endemic *Sorbus wilmottiana* is given, based on field, literature and herbarium studies. 42 trees are currently known from seven sites in the Avon Gorge, and we have been unable to refind it in one site. Under the 1994 I.U.C.N. threat criteria it is categorised as 'Critically Endangered'.

KEYWORDS: Gloucestershire, Somerset, conservation.

INTRODUCTION

*Sorbus wilmottiana* E. F. Warburg, Wilmott's Whitebeam, is amongst the rarest and least known of the trees in Britain. It is an endemic species, confined to partially-wooded limestone rocks and slopes of the Avon Gorge, Bristol, on both the west (v.c. 6 North Somerset) and east (v.c. 34 West Gloucester) sides of the gorge. Nethercott (1998) described its population size as "X – where X is a very small number", and noted that its conservation record in recent years had been disastrous. Flanagan (1998) regarded it as one of the four species of *Sorbus* with the highest priority for conservation in Britain.

*Sorbus wilmottiana* was first noted in Warburg (1962); the name was legitimised posthumously with a Latin description and designation of a type specimen in Sell (1967). It appears that Warburg first found it on 14 September 1933 whilst investigating trees which had been erroneously called *S. hungarica* (Bornm.) Hedl., collected by J. W. White (cf. Salmon 1930). Warburg subsequently visited the gorge on many occasions and collected fruit (e.g. note on herbarium sheet at BM "seed no. 23") and determined that it was polyploid, but no records of his count survive (the only chromosome count traced is that of  $2n=51$  by H. McAllister in the B.S.B.I. Cytological Database). Warburg decided to give it a name once it had also been found on the Somerset side of the gorge (Nethercott 1998). During a tour of *Sorbus* in South-west England in autumn 1958, Warburg twice visited the Avon Gorge with R. A. Graham, R. M. Harley and D. H. Lewis, and *S. wilmottiana* was subsequently described from material collected from the edge of Clifton Down during the second visit (specimens **ex herb. R. M. Harley**, holotype in **OXF**, isotypes in **K** and **RNG**).

As part of work on the rare *Sorbus* species of the Avon Gorge, we have compiled records from herbaria (**BM**, **BRISTM**, **CGE**, **K**, **NMW**, **OXF**, **RNG**) and carried out field work between 1996 and 2003. A number of literature references and other botanical records have not been accepted, due to confusion with *S. aria* (L.) Crantz and another unnamed taxon (cf. Rich & Houston 1997). The records and details of population sizes we have traced are listed in the Appendix. Like Sell (1989), we consider that giving exact localities for rare trees is preferable to their being cut down without anyone being aware of their interest or location. Some fuller details have been lodged with the National Trust, English Nature, the Threatened Plants Database and the National Biological Records Centre, Monks Wood.

## IDENTIFICATION

In many respects *S. wilmottiana* appears morphologically to be part of the complex variation within *S. aria* sensu lato in the Avon Gorge (Rich & Houston 1996 were able to recognise at least eight forms of *S. aria* in one part of the Avon Gorge alone), so it is surprising that Warburg picked it out as a distinct taxon at all; he may have placed emphasis on its ploidy level. Nonetheless, we accept it as a distinct, uniform taxon, which is supported by other studies. Investigations by Proctor & Groenhof (1992) showed it to have distinctive peroxidase phenotypes. Lemche (1999, excluding her 'wilmottiana 23' which is now known to be *S. aria*), also found it distinct in RFLP and microsatellite DNA analyses.

*Sorbus wilmottiana* is distinguished by the leaves of the lateral rosettes being 1.6–2.1(–2.2) times as long as wide, rhomboidal with widest point (45–)46–58(–62)% along the leaf, with (7–)7.5–10.5(–11) pairs of veins held at an angle of (20–)26–36(–37)° to the midrib, with 5–8 shallow lobes extending *c.* 1/9 way to the midrib and finer marginal teeth, with the upper surface green and the lower surface white-tomentose (Fig. 1). The largest fruit are (8–)12–13 × (9–)10.5–13 mm, subglobose or longer than wide (and usually looking longer than wide), red at maturity with a moderate number of moderate-sized lenticels scattered over the fruit.

*Sorbus wilmottiana* differs from forms of *S. aria* in the Avon Gorge in having narrower, shallowly lobed rhomboidal leaves with generally fewer veins. The local forms of *S. porrigentiformis* E. F. Warburg and *S. eminens* E. F. Warburg (*sensu* Proctor & Groenhof 1992) differ in having respectively obovate, unlobed leaves and fruits broader than long, and orbicular, unlobed leaves.

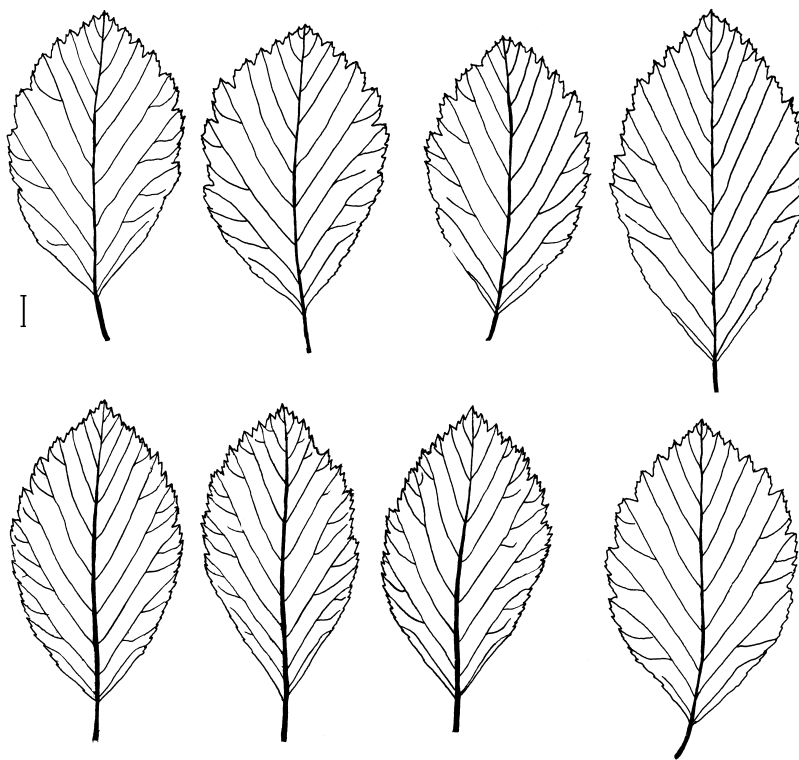


FIGURE 1. Typical lateral rosette leaves of *Sorbus wilmottiana* from sun-lit situations. Scale bar = 1 cm.

## SITES AND POPULATION SIZES

## V.C. 6. NORTH SOMERSET

Hendry & Pearson (1973) reported 'probably less than 10 all within the N.N.R. area' for the Somerset side of the Gorge, probably based on data supplied by P. J. M. Nethercott.

Site 1. Quarry 3, Leigh Woods (ST560743).

One tree was reported above Quarry 3 by Russell (1979). This quarry and the ridges and cliff tops above have been searched on several occasions in 2001–2003, but no *S. wilmottiana* has been refound, although six other *Sorbus* taxa occur. The quarry is used as a rifle range by the police, and some scrub clearance has taken place, at least in the bottom of the quarry.

Site 2. Quarry 4, Leigh Woods (ST561739).

*Sorbus wilmottiana* has been known in this quarry since 1958, and Russell (1979) reported eight fruiting trees and three saplings. This is perhaps the best known site of *S. wilmottiana*, and one tree in particular on the lower slopes of the quarry was often demonstrated to visiting botanists (e.g. during the Avon Gorge excursion associated with the B.S.B.I. A.G.M. in Bristol 8 May 1983). However, this tree was accidentally cut down during scrub clearance work in February 1995. Although it showed healthy regrowth two years later, it does not appear to have survived, possibly due to deer browsing the regrowth. In 2003, 17 trees of a range of sizes and several possible saplings were counted on the steep slopes, cliff edges and sheer faces around the top of the quarry.

Site 3. Cliff by railway line between quarries 4 and 5 (ST562738).

Eleven (possibly 12) trees were found on a sheer face above the railway in 1999. A further tree was recorded in 2001 during work in connection with the reopening of the Bristol to Portishead railway line. One tree was topped during preliminary line clearance work. Otherwise the colony remained undamaged and a safety fence has been erected between quarries 4 and 5 to protect it from wholesale removal of vegetation.

Site 4. Great Slab (ST561738).

Two trees and four possible saplings were first found here by L. Houston in 2002.

Site 5. Leigh Woods (ST558734).

One fruiting tree c. 7 m tall in woodland glade, first found by Bill Morris in 2001 during woodland management work.

## V.C. 34. WEST GLOUCESTER

Site 6. Edge of Clifton Downs (ST563742).

This type tree appears to have been known since at least 1933 but was cut down to improve the view across the river in 1969 by the Corporation of Bristol (Willis 1969). Steps were taken to protect the stump which fortunately still showed signs of life, and by 1976 it had recovered and was fruiting abundantly (Willis 1976). The tree was subsequently lost, but was refound in 1997 by L. Houston, M. A. R. Kitchen & C. Kitchen using undated directions by Mark C. Smith, former Superintendent of Bristol University Botanic Garden (NB this location is incorrectly shown in Bailey *et al.* 1972). It fruited well in 2002.

Site 7. Walcombe Slade/The Gully, south side (ST562744).

An unspecified number of shrubs were known to P. M. J. Nethercott on north-west facing grassland towards the bottom of Walcombe Slade (also known as The Gully), prior to the records cited above (see area WN1 in Bailey *et al.* 1972). At least three trees were cut down during conservation work in the 1990s or earlier, including one well-known tree in 1995; they have subsequently regrown. Seven shrubs were counted on 20 May 2003 (NMW).

Site 8. Walcombe Slade/The Gully, north side (ST5674).

One tree in area cleared of scrub near the outcrop at the top north-west end of the Gully at ST563746, 20 May 2003, L. Houston & T. C. G. Rich. One tree in *Carex humilis* clearing cut down during conservation work but regrowing well, ST562745, 20 May 2003, L. Houston & T. C. G. Rich.

## ERRONEOUS AND UNCONFIRMED RECORDS

A rare species population form 14 June 1975, L. Farrell, has a grid reference for Leigh Woods quarry 1, which has later been corrected with various grid references to Leigh Woods quarry 4. A small number of unverified trees were reported from Quarry 2, Leigh Woods (ST558744?) by Russell (1979); we have visited this quarry on a number of occasions but have been unable to find any *S. wilmottiana* though at least four other *Sorbus* species are present. Trees in, and on the edge of, The Great Quarry (sites T1 and T2 of Bailey *et al.* 1972) with unlobed leaves were once demonstrated as *S. wilmottiana*, but are now known to refer to another taxon (cf. Rich & Houston 1997). A single tree from Great Fault, Clifton Down (site BV4 of Bailey *et al.* 1972), 29 August 1957, P. J. M. Nethercott (OXF) has broader leaves; it is not currently accepted as *S. wilmottiana* and is probably referable to *S. aria*. Tree no. 8, The Gully, reported as close to *S. wilmottiana* by Rich & Houston (1996), is now known not to be *S. wilmottiana*.

In summary, 42 trees and six possible saplings are known from seven sites in the Avon Gorge, and we have been unable to refind it in one site. The distribution is shown in Fig. 2.

Anyone wishing to see *S. wilmottiana* is strongly advised to visit the planted tree on the edge of the grassland known as The Plain at Leigh Woods (ST557732) or those around Bristol University Botanic Garden at Bracken Hill before attempting to find it elsewhere in the Avon Gorge. No further leaf or fruit material should be collected from known sites. We will be happy to verify material from new sites.

## BIOLOGY AND ECOLOGY

Relatively little is known about the biology and ecology of *S. wilmottiana*, most of which has been taken from Russell (1979). It grows to about 10 m tall, and will fruit before the trunk diameter at breast height reaches 4 cm. It occurs on calcareous rocks, screes and shallow soils, ranging from vertical rock faces to short open scrub and grassland. Soil pHs measured at the type tree were pH 6.9, on limestone soil around The Gully pH 6.6 and on the plateau clay soils in Leigh Woods pH 5.9. Like many others of the *S. aria* group, it is probably a light-demanding species, and is generally absent from tall, closed woodland.

It flowers in May and early June, but varies from year to year (e.g. 2002 was an excellent flowering year, but only one inflorescence was seen in 2003). Potential pollen inviability, assessed using Alexander's Stain (Alexander 1969), was 40% for the tree planted on The Plain (A. Karran, NMW). The fruits ripen between the end of August and early October, but fruit set appears variable from year to year. In 1976 Russell (1979) recorded an average of 23 fruits per inflorescence, and 125–145 viable seeds per 100 fruits (this reproductive output is lower than *S. anglica*, *S. aria* and *S. bristoliensis* which he also studied). Seed germination trials showed that no germination occurred in pots stored in sheltered conditions under trees (including coverage by leaf fall), but 10–20% germination was recorded in pots placed in exposed conditions. Further significant germination was noted three years after sowing. Berries were popular with a wide range of bird species and were freely eaten by small mammals. The saplings found during our surveys suggest that this species is regenerating, but the identifications need to be confirmed when they are mature; it certainly grows readily from seed.

## CONSERVATION

Under the 1994 I.U.C.N. threat criteria (I.U.C.N. 1994) used for British plants (Wigginton 1999) *S. wilmottiana* can be categorised as 'Critically Endangered'. Its conservation record has indeed been unsatisfactory. At least five trees have been cut down during habitat management work (including one damaged during conservation work we were involved in). However, only one of these appears to have subsequently died. Once cut down, the trees usually respond by coppicing and regrow from the base, but it may take at least seven years for foliage to show its characteristic mature shape. Nethercott (1998) reported that one, possibly two, trees had also been stolen.

Material, possibly all originating from the type tree, is held in cultivation at Bristol University Botanic Garden, Cambridge University Botanic Garden, Ness Botanic Garden and National Botanic Garden of Wales, and seed has been deposited in the Millennium Seed Bank, Wakehurst Place.

All trees are currently within the Avon Gorge S.S.S.I. and S.A.C.

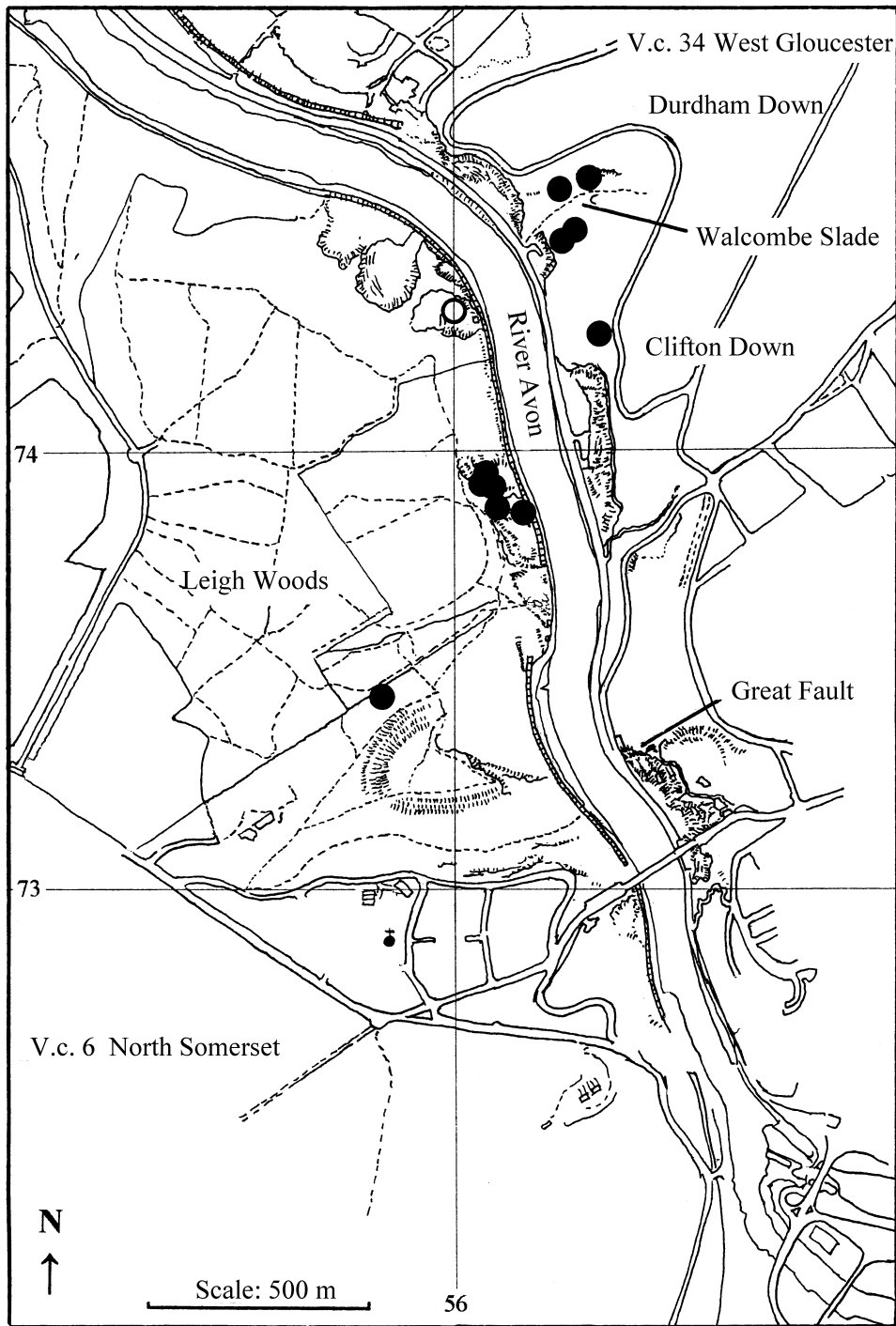


FIGURE 2. Detailed distribution of *Sorbus wilmottiana* in the Avon Gorge, Bristol. ● = 1996-2003, ○ = Not refound.

## ACKNOWLEDGMENTS

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## APPENDIX 1

RECORDS OF *SORBUS WILMOTTIANA*

Site 1, Quarry 3. Leigh Woods, ST560743, 7 September 1977, P. D. Sell (**CGE**).

Site 2, Quarry 4. Leigh Woods, 10 July 1958, P. J. M. Nethercott (**OXF**). Rocky slope, ST561741, 6 June 1972, P. D. Sell (**CGE**). One plant, 14 June 1975, L. Farrell & P. J. M. Nethercott (rare species population form, English Nature; grid reference incorrect). Top of steep sloping limestone slab, 7 June 1976, R. J. Pankhurst & J. M. Mullin (**BM**). T. C. G. Rich, 8 May 1983 (**NMW**). 27 July 1989, P. J. M. Nethercott, A. Robinson & I. Taylor (rare species population form, English Nature; grid reference incorrect). ST/560.739, 2 October 1996, L. Houston (**NMW**). ST561739, 14 June 2001, T. C. G. Rich & L. Houston (**NMW**).

Site 4, Great Slab. Wooded rock face, L. Houston & T. C. G. Rich, 21 August 2002 (**NMW**).

Site 6, Edge of Clifton Downs. On limestone rock, 7 and 29 June 1922, J. W. White (**BM**, as '*S. aria* var. *incisa*', though other material he collected under this name is not *S. wilmottiana*; assumed to be this site). By cliff edge, 14 September 1933, E. F. Warburg (**BM**). 19 September 1935, E. F. Warburg (**BM**). 10 October 1956, E. F. Warburg (**LTR**, **OXF**). Edge of the greensward at top of Avon Gorge cliffs, ST563742, 27 September and 4 October 1958 (type), R. A. Graham, R. M. Harley, D. H. Lewis & E. F. Warburg (**K**, **OXF**, **RNG**). Type tree, 25 May and 7 September 1964, P. J. M. Nethercott (**BRISTM**). Type tree, single tree on edge of cliff, ST563742, 18 September 1966, S. M. Walters (**CGE**). Tree known to Dr Warburg, 29 September 1966 and 6 July 1967, P. J. M. Nethercott (**BM**). ST5674, 9 September 1997, T. C. G. Rich, M. Way, J. Carey *et al.* (**NMW**). Type tree, ST563742, 20 June and 10 October 2001, T. C. G. Rich & L. Houston (**NMW**).

Site 7, Walcombe Slade/The Gully, south side. Durdham Downs, scree, rare, ST563746[?], 7 October 1989, S. H. Bishop and R. J. Cooper (**BRISTM**). Grassland, ST562744, 20 June 2001, L. Houston (**NMW**). Group of four trees in grassland, ST562744–5, 21 August 2002 and 20 May 2003, L. Houston & T. C. G. Rich (**NMW**).

