Service tree

Sorbus domestica

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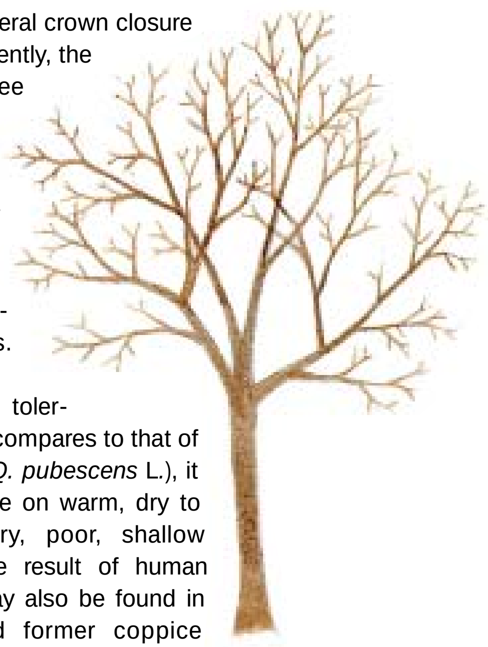
These Technical Guidelines are intended to assist those who cherish the valuable service tree genepool and its inheritance, through conserving valuable seed sources or use in practical forestry. The focus is on conserving the genetic diversity of the species at the European scale. The recommendations provided in this module should be regarded as a commonly agreed basis to be complemented and further developed in local, national or regional conditions. The Guidelines are based on the available knowledge of the species and on widely accepted methods for the conservation of forest genetic resources.

Biology and ecology

The service tree is a close relative of rowan (*S. aucuparia* L.), the wild service tree (*S. torminalis* Crantz.) and whitebeam (*S. aria* (L.) Crantz). Young trees are easily mistaken for rowan, having very similar leaves and overall morphology. Once it is mature, it is very distinct, mainly due to the coarse and pear-like bark, green and “gluey” buds and the 2-3 cm large apple or pear shaped fruits.

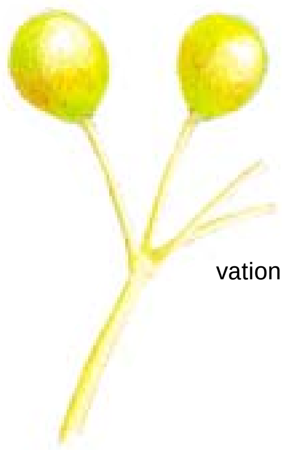
In its natural niche of poor, dry sites, the service tree grows to a medium size of 15-20 m in height. On rich, fresh soils, however, it can outgrow oak and surpass 30 m in height and 60 cm in diameter within 130 years. *S. domestica* has a dense and tough wood of high value used for special purposes. It flowers regularly and produces large amounts of fruits which are dispersed effectively by birds and mammals. In spite of this, natural regeneration from seed is scarce throughout Europe, and it is still not understood why. Vegetative propagation by root suckers however, is common, especially on warm and favourable sites.

Although *S. domestica* is winter hardy, able to withstand -30°C and is less susceptible to late frost than sessile oak, it prefers warm and mild climates with extended vegetation periods. In central Europe it occurs on warm, South facing slopes below 650 m in altitude, whereas in the Mediterranean it is found at higher elevations. It is tolerant to soil conditions, and occurs on a wide variety of sites. The service tree is a light demanding species and only tolerates shade in the first few years. Despite its rather good growth capacity, it is a very weak competitor. It does not withstand or tolerate lateral crown closure and consequently, the service tree never dominates and is usually present as a few individuals in a mix of less competitive species. Due to its high drought tolerance, which compares to that of downy oak (*Q. pubescens* L.), it finds its niche on warm, dry to extremely dry, poor, shallow sites. As the result of human activity, it may also be found in coppice and former coppice with standard type forests or in other favourable situations such as forest fringes or extreme slopes.



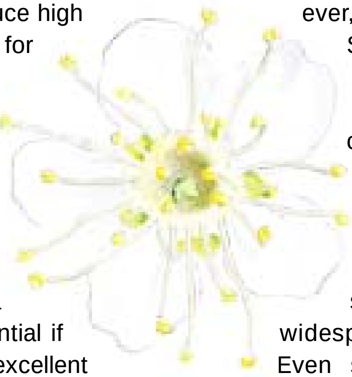
Distribution

The natural range of the service tree is restricted to southern and central Europe, centred in the Balkan peninsula, Italy and southern France. The complete, potential distribution is currently unknown, as inventories are still required in many areas. It is also unclear how much of this is natural distribution, since *S. domestica* has spread through cultivation since Roman times.



Importance and use

The service tree has been highly valued since Roman times. The fruit has been used as produce, to cure intestinal problems, and as an additive for conserving apple cider. The wood was used for mechanical parts, yardsticks, inlays or instruments. Today, the fruits are still used to conserve apple cider, to produce high quality liquors, and for specialist products such as marmalades. There is now little wood production due to its low abundance. Nevertheless, *S. domestica* has a high economic potential if planting material of excellent genetic quality is used. In most countries in central Europe, the service tree is very rare and threatened, and is considered a valuable biological resource worthy of conservation.



Genetic knowledge

Very little is known about the genetics of the service tree. However, due to its scarce numbers, low density and high degree of fragmentation and isolation, reduced genetic diversity and high differentiation would be expected according to population genetics theory. However, a study of Swiss and German populations has not confirmed these expectations, and genetic diversity was found to be similar to that of widespread species. Even small, isolated demes of less than 20 trees had remarkably high levels of diversity. Sub-populations were found to be more genetically differentiated than in widespread species, but less than expected for fragmented and isolated populations. Pollen gene flow was found to be surprisingly high. Supported by similar findings in other dispersed species, results suggest that the genetic system of naturally rare species seem to be well adapted to low densities. Long-distance gene flow, dynamic meta-population structures with local extinction and recolonisation, long-distance migration events through effective seed dispersal and a mixed reproductive system may be key elements for maintaining genetic diversity in rare species like *S. domestica*. While vegetative reproduction conserves genetic diversity even in the smallest populations, long-distance pollen and seed dispersal guarantee recolonisation.

Threats to genetic diversity

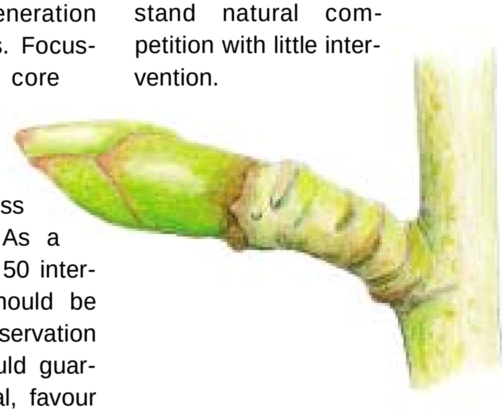
S. domestica is very rare and threatened in many European countries. The species and its genetic diversity are threatened by: 1) an overall reduction in the number of individuals; and 2) disturbance of the natural meta-population structure due to human impact. Intensive forestry, overstocked and dense stands, silvicultural practices, loss of suitable habitats, neglect, and insufficient knowledge and perception, all contribute to a reduction in population size. Insufficient or missing recolonisation events and opportunities lead to a change in population and age structures, a reduction in population size and a higher degree of fragmentation and isolation of fragments. Reduced levels of gene flow and migration and higher levels of inbreeding will eventually result in a loss of genetic diversity and higher genetic differentiation among the fragments.

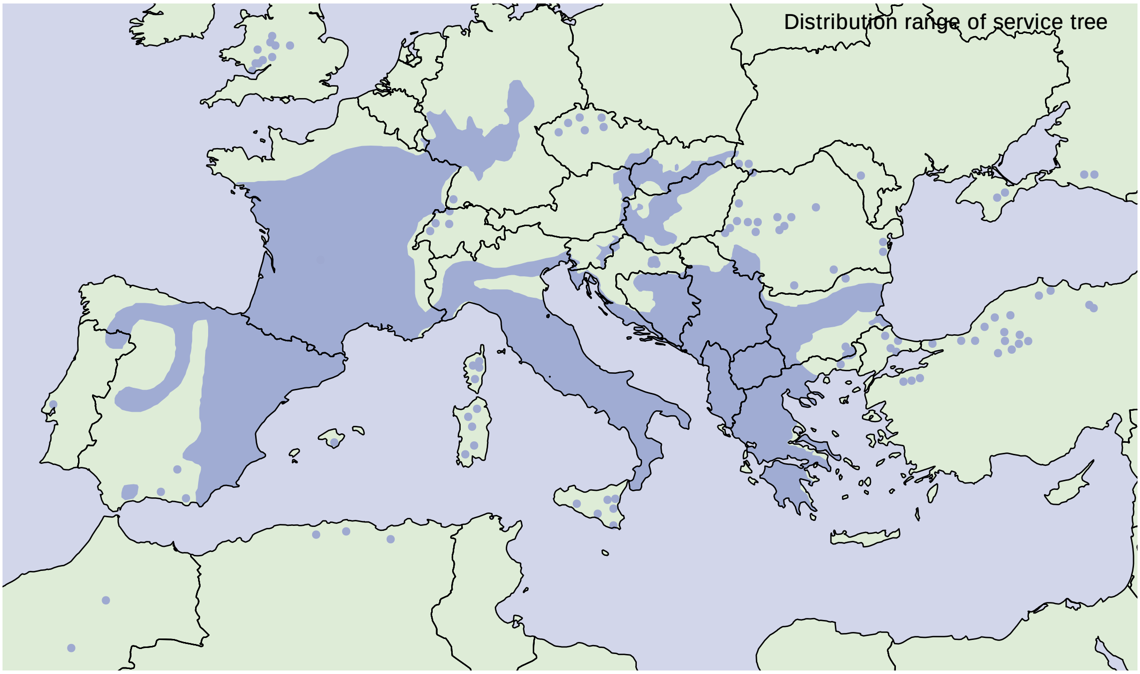
Guidelines for genetic conservation and use

Conservation priorities and measures depend on the current population size, population structure and existing or potential threats. Thus, *in situ* conservation efforts must begin with inventories, assessing population size and structure, core populations, fragmentation, threats and threatening processes, as well as conservation needs and priorities.

No rule can be given regarding the minimum number and size of populations to be conserved since it depends on the specific situation of the species (demography, threat, habitat availability etc) and the available financial means. At the very least, the most viable core population should be designated as a conservation unit in which *S. domestica* is favoured above all other species in regeneration and tending operations. Focusing efforts on these core populations, which are the largest and most viable, should ensure maximum success with minimum costs. As a rule of thumb, at least 50 interbreeding individuals should be selected for such a conservation unit. Management should guarantee individual survival, favour vitality and fertility, and attempt to create a sustainable age structure for the future. All objectives and necessary measures need to be clearly defined, documented and integrated into local management plans.

Where additional measures are feasible, other core populations should be added to create a network of conservation units. If possible, core populations should be linked with neighbouring cores or should be enlarged in order to guarantee their long term survival. In addition, smaller demes and even single trees, which serve as stepping stones for gene exchange, should be integrated into the network. Until further information on gene flow is available, demes and individuals may be considered linked if they are closer than 3 km. In most cases, conservation and promotion of *S. domestica* requires plantations, since natural regeneration is sparse or inexistent. These should be restricted to favourable sites where the service tree is able to withstand natural competition with little intervention.





It is highly recommended that *in situ* conservation measures are accompanied by *ex situ* collections even if sufficiently large core populations still exist. Seed orchards can produce genetically diverse planting material which is difficult or impossible to collect from wild populations. In addition, *ex situ* collections may serve as genebanks or for breeding activities. High quality planting material is important since regeneration is usually achieved artificially.

Conservation efforts are most successful if they are integrated into common forestry practice. Information, training, and the perception of the species in the forest service are thus decisive for successful conservation and it is hoped that these guidelines serve as a starting point for this purpose.

EUFORGEN

These Technical Guidelines were produced by members of the EUFORGEN Noble Hardwoods Network. The objective of the Network is to identify minimum genetic conservation requirements in the long term in Europe, in order to reduce the overall conservation cost and to improve the quality of standards in each country.

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The distribution map was compiled by members of the EUFORGEN Noble Hardwoods Network based on an earlier map published by Kausch-Blecken v. Schmeling, W. in 2000 (The service tree (*Sorbus domestica* L.) (in German). 2.Edition, 184 p. Verlag Kausch, Bovenden Germany).

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