

# Wild apple and pear

*Malus sylvestris*/*Pyrus pyraster*

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These Technical Guidelines are intended to assist those who cherish the valuable wild apple and pear gene pool 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.

## Biological and ecology

Wild apple (*Malus sylvestris* (L.) Mill.) and wild pear (*Pyrus pyraster* (L.) Burgsd.) belong to the family Rosaceae. They are insect pollinated and are both quite rare species.

Wild apple trees have expanded crowns and often look like bushes. They can grow up to 10 m tall with trunk diameters of 23-45 cm and can live 80-100 years.

Under good growing conditions, wild pear trees have a remarkably slender form with a characteristic rising crown. In less favourable conditions they show other characteristic growth forms, such as one-sided or extremely low crowns. Trees can reach heights of 22 m with clean trunks up to 10 m, and diameters of 45-80 cm (maximum 130) at an age of 80-150 years (maximum 250). *P. pyraster* is able to



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grow on very dry sites due to its tap roots.

Owing to their weak competitive ability, wild apple and wild pear exist mostly at the edge of forests, in farmland hedges or on very extreme, marginal sites.

Without competition by other tree species, *P. pyraeaster* would have a wide physiological range and physiological optimum. Wild pear can grow on almost all soils, except the most acidic. Best growth occurs on fresh, calcareous soils. With competition, the species is often displaced to more extreme sites (very dry or wet). The preferred niches for wild pear are close to the dry or wet edges of the forest. *P. pyraeaster* favours South and West facing slopes.

The ecology of *M. sylvestris* is similar to that of *P. pyraeaster*, except that wild apple is more indifferent to soil type. The preferred niches are on the wet edge of the forest.

Both species have extremely high light requirements and do not tolerate competitive pressure well, especially by beech. There are well known occurrences of wild fruit trees in river floodplain forests where both native species (apple and pear) are associated.

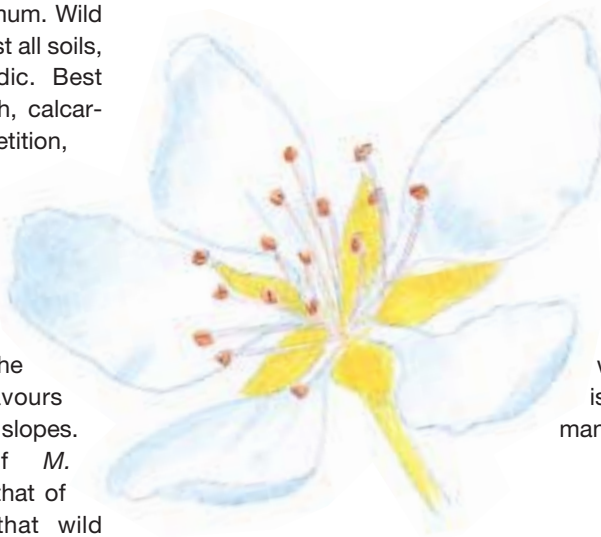
## Distribution

Both species are native in most European countries, and they occur in a scattered distribution pattern as single individuals or in small groups.

## Importance and use

Hybridization with cultivars grown for fruit production is supposed to be very common, making it very difficult to identify pure wild fruit trees. In the past, only morphological characters were used for identification purposes. Two main traits to characterize *M. sylvestris* are hairiness of the undersides of leaves and fruit width. Important traits to characterize *P. pyraeaster* are fruit width and fruit and leaf form.

Wild apple timber is of low economic value, whereas that of wild pear is highly valued and has many potential uses.



# *Pyrus pyraster* Wild apple and pear *Malus sylvestris* *Pyrus pyraster* Wild apple and pear *Malus syl*

## Genetic knowledge

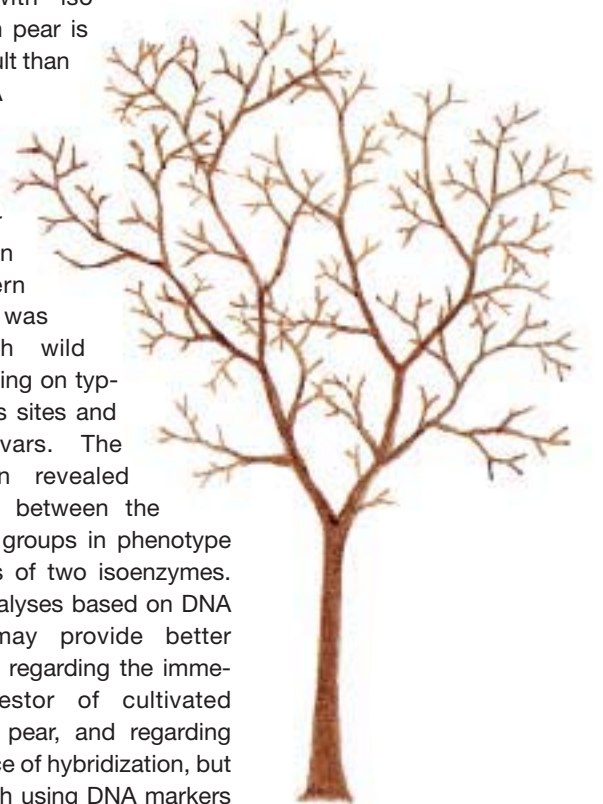
The genetic variation and structure of *M. sylvestris* and *P. pyraster* is not yet known in detail and requires extensive study. The two species show great phenotypic variation and it is assumed that various ecological types can be distinguished due to the large natural distribution area.

Genetic analyses have been undertaken mainly on domesticated varieties of apple. *Malus* is a genus of the northern temperate zone with 25-35 (47) species that are difficult to identify due to the lack of distinguishing traits. This is supposed to be largely the result of introgression between cultivated varieties and wild species. Isoenzyme analyses at the species level in *Malus* are limited, but are a common method in cultivar identification. Until recently, this method had failed to distinguish *M. sylvestris* (in the past represented only by a few single trees), *M. pumila*, *M. orientalis*, *M. asiatica* and *M. sieversii* from each other or these closely related wild species from *M. × domestica*. The level of genetic diversity was found to be very high in all these species and very similar to that found in the domesticated apple. It has been suggested that these are not distinct species, but have formed one large population extending from western China to Europe. Recent research, investigating

more than 100 individuals of *M. sylvestris* from northwestern regions of Germany, partially rejects this hypothesis since species-specific alleles have been identified. These alleles have been found at relatively high frequencies, indicating that the introgression of *M. sylvestris* genes into the *M. × domestica* genepool has rarely or not occurred in the past at all since *M. × domestica* has been grown. Different genepools have also been identified by analysing native *M. sylvestris* in Belgium.

There is little genetic information known about *P. pyraster*. Working with isoenzymes in pear is more difficult than for apple. A comparison of 183 clones of *P. pyraster* collected in northwestern Germany was made with wild pears growing on typical species sites and with cultivars. The comparison revealed differences between the three pear groups in phenotype frequencies of two isoenzymes. Genetic analyses based on DNA markers may provide better information regarding the immediate ancestor of cultivated apple and pear, and regarding the influence of hybridization, but the research using DNA markers

has yet to be performed. Only a few experiences of applying PCR based methods to *M. sylvestris* are available.



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## Threats to genetic diversity

Genetic resources of wild apple and wild pear are seriously endangered, for the following reasons:

**Rare occurrence** and a narrow genetic base cause genetic drift due to small numbers of mother trees and large distances between adult trees;

**Natural regeneration** is not guaranteed and, if it occurs, it is endangered by grazing; Hybridization with cultivated forms of apple and pear is considered to be a major obstacle. Recent investigations in apple indicate that hybridization has not been that rampant as expected.

**Useful identification keys** have been developed, but are not satisfactory (distinguishing characters may not be developed consistently on an individual tree level); and

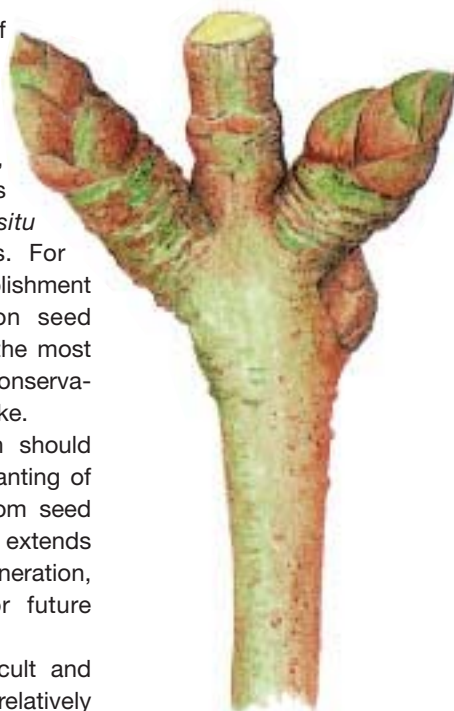
**Uncontrolled seed transfer.** In EU countries wild apple and wild pear are not included under national legislation for forest reproductive material. Therefore, seed of unknown origin is used for afforestation purposes in the landscape and along highways.

## Guidelines for genetic conservation and use

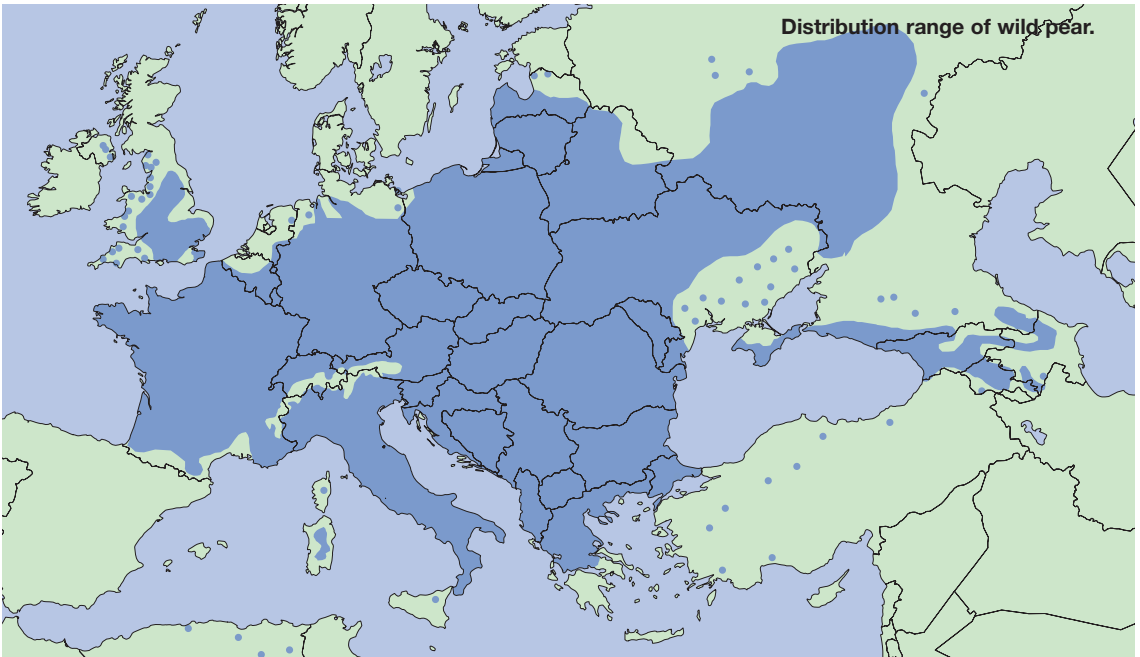
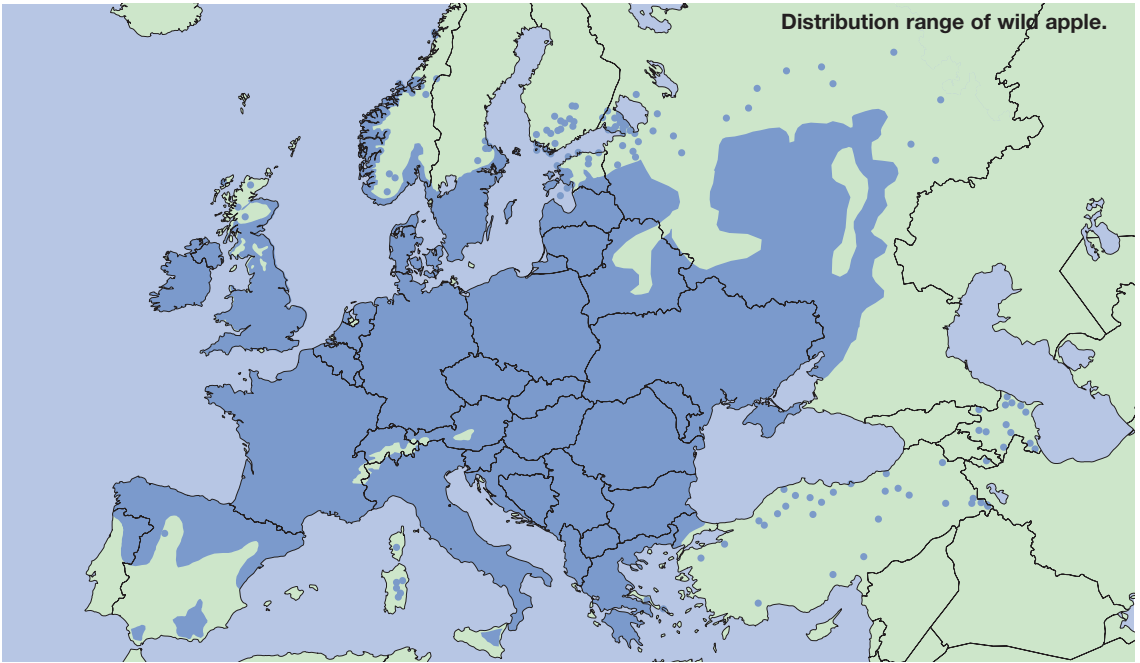
The natural situation of these rare fruit tree species and their occurrence as single individuals or in small groups, restricts the possibilities for implementing *in situ* conservation strategies. For both species, the establishment of *ex situ* conservation seed orchards seems to be the most suitable and efficient conservation measure to undertake.

Natural regeneration should be supplemented by planting of seedlings originating from seed orchards. This method extends the genetic base of regeneration, which is important for future adaptability.

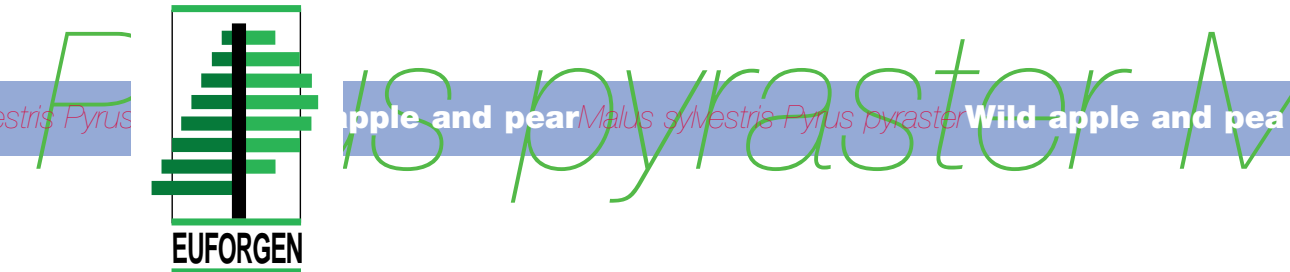
Grafting is not difficult and seed orchards can be relatively easily established. A minimum of 50 clones per seed orchard and region should be selected. New breeding populations can be restored when individual specimens, scattered over a large, but ecologically similar area, are collected and planted together in the seed orchard.



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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 maps were compiled by members of the EUFORGEN Noble Hardwoods Network based on an earlier maps published by (i) Kutzelnigg, H., 1995: *Pyrus*. In: Scholz, H. (Hrsg.), 1995: *Gustav Hegi. Illustrierte Flora von Mitteleuropa. Band IV, Teil 2B (2. Aufl.)*. Blackwell, Berlin. S. 278-288; (ii) Meusel H., Jäger E. Weinert E. 1965. *Vergleichende Chorologie der Zentraleuropäischen Flora*. Veb Gustav Fischer Verlag, Jena, 1. Karten, pp. 258 (iii) Wagner, I., 1995: Identifikation von Wildapfel (*Malus sylvestris* (L.) MILL.) und Wildbirne (*Pyrus pyraster* (L.) BURGSD.) Voraussetzung zur Generhaltung des einheimischen Wildobstes. *Forstarchiv* 66: 39-47.

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