

Pinus pinaster Aiton

(maritime pine)

Silviculture and properties

Maritime pine is a species that is being considered as an alternative to some widely used trees if climate change proceeds as predicted. **Peter Savill** describes its characteristics.

Maritime pine (*Pinus pinaster*) is a two needled pine that can be distinguished from other pines by its thick, deeply fissured bark, long (15-20cm) stout leaves, and persistent stalkless cones 10 to 15cm long, which occur in star shaped horizontal clusters of 4 to 8 (responsible for an earlier name to the species, the cluster pine). They open slowly, over several years. The winter buds are long and stout with reflexed scales. It is also recognizable because the trees are seldom straight and the branches are slightly upturned. In fact, tree form in unimproved populations is generally rather poor. Many trees have a pronounced butt sweep, crooked stems and relatively heavy, upright branching. Up to 20% of stems are forked and vigour can be extremely variable within stands (Hopkins and Butcher, 1994). According to Farjon (1998), the species is sometimes split into two or three subspecies but the differences between them are small and poorly researched.

The tree has a strong taproot that goes deeply into the soil, but lateral roots are generally rather weak, which probably accounts for the trees' tendency to lean.

Origin and introduction

Maritime pine is a tree of low to medium elevations (up to 600m, but to 2000m in the south of its natural range). It is native to the central and west coastal region and islands of the Mediterranean and the Atlas mountains of North West Africa, Tunisia, Algeria and Morocco. It also occurs on the Atlantic coasts of France and Portugal where it has also been extensively planted (Macdonald et. al., 1957). Its natural range spans more than 30° of longitude and 10° of latitude. It was introduced to Britain before 1596 according to Mitchell

(1974). The tree is common in the south of England with small plantations in the New Forest and Wareham areas, and there are small semi-wild populations in W. Surrey and N. Hampshire. It has also been planted quite widely as an exotic elsewhere.

Large quantities of seed were imported by the Forestry Commission between 1925 and 1935 from the Landes (France), from Leiria (Portugal) and from Corsica. A 1949 provenance experiment, reported upon by Macdonald et. al. (1957) showed that there was little to choose between the provenances though the Portuguese ones grew faster initially and were less wind firm than trees of French or English origin.

The tree grows to a maximum of 30m in Great Britain (Johnson 2003), and rarely to 40m tall in parts of its native range.



An extensive Pinus pinaster plantation in the 11,000ha Leiria National Forest, Portugal. The forest was originally established from seed centuries ago and now relies mainly upon natural regeneration. (Photo: Dr Luis Fontes)

Species Profile

Climatic requirements

Pinus pinaster does best in Mediterranean climates; those with cool, wet winters and hot, dry summers. It will tolerate temperatures of -15°C and droughts of up to four months duration with less than 40mm of rainfall (CABI, 2014). It is only moderately tolerant of exposure, except for sea winds, which it withstands well. Large areas of Portuguese provenance maritime pine in the Landes were killed by frost in the mid 1980s. Sensitivity to cold and exposure restricts its use to southern and coastal regions in Britain (Forest Research, 2014).

Site requirements

The species generally grows best on lighter, acidic or neutral sandy soils near the sea, but it can also grow on saline soils and very shallow soils. It does not tolerate peats or wet gleys, and calcareous soils should be avoided.

Other silvicultural characteristics

It is a strongly light demanding, pioneer species that frequently grows in pure stands. In Britain it is only suitable on sites in the south where it can grow faster than Corsican pine. Maritime pine is easily established by direct sowing, though nursery-grown, one year old seedlings also do well. Like many light demanders, thinning must be done early and heavily and according to Brown and Nisbet (1894), and the crowns of individual trees should be kept clear of each other at all stages of their development.

Pinus pinaster is widely planted as a timber tree within its native range in France, Spain and Portugal and is one of the most important forest trees in these countries. The largest



A young *Pinus pinaster* plantation in Leiria National Forest, Portugal. (Photo: Dr Luis Fontes)

man-made forest in the world, the 900,000ha Les Landes on the Atlantic coast of S.W. France, was planted from 1789 onward almost entirely with *Pinus pinaster* (Osmaston, 1968). It was originally planted for reclaiming a huge area of shifting sand dunes that threatened fertile farms further inland. The species has been widely planted in many other parts of the world with a Mediterranean climate, and is now naturalised in South Africa and elsewhere; in recent years planting outside Europe has declined considerably as *P. radiata* provides larger crops of better quality timber in the same conditions.

It is moderately susceptible to red band needle blight and is likely to be affected by *Heterobasidion annosum* (Fomes root and butt rot), especially on dryer sites with mineral soils. Infection by pine wilt nematode, which is established in Portugal, can also result in high mortality rates for species such as maritime pine. In fact, planting of the species in Portugal has been much reduced because of the nematode.

Provenance

According to Forest Research's (2014) website, very limited provenance testing has been carried out in Britain; preferred seed sources should be from the Landes region of France ideally using improved material from French breeding programmes. A very large breeding programme has been carried out in Western Australia (Hopkins and Butcher, 1994) that has resulted in very significant improvements over 'commercial controls' (more than 10% for diameter and height, 44% for stem straightness, and 20 to 30 % for branch size and angle).

Natural regeneration

Troup, in his book *Silvicultural Systems* (1928), used the example of maritime pine to illustrate the system of clear cutting with natural regeneration. In the Landes forest clear cutting is carried out in quite large coupes and natural regeneration springs up plentifully from seed, some of which is already on the ground, but much is derived from the cones of felled trees in April and May. Natural regeneration is favoured by the abundant annual seeding of the pine on loose sandy soil, and complete exposure to overhead light. After felling and removal of the timber, the brash is spread evenly over the coupe to distribute the seed and produce an even stocking of young plants. Maritime pine is quite seriously invasive in parts of the Cape Province of South Africa and many other places. It will also regenerate after fires, which cause the cones to open and release seed.



A managed natural stand of *Pinus pinaster* at Leiria, Portugal (right) and improved *Pinus pinaster* in Western Australia (left). (Photos: Dr Luis Fontes).

Flowering, seed production and nursery conditions

Seed production begins at about age 15 years. The tree flowers in May, and seeds ripen the following April and should be sown then. Germination and growth are rapid.

Timber and uses

Maritime pine has a yellowish white sapwood and a reddish heartwood. It is mainly straight-grained with a medium texture. The wood is coarse grained and very resinous. The sapwood is not durable, though easily treated by preservatives. The heartwood is naturally durable. The timber is hard and heavy. The wood splits easily along the grain and is flexible. It has good compression resistance, but is less elastic during bending than Scots pine. The average density at 15% moisture content is about 560 kg/m³.

The main uses for sawn timber are joinery, both interior

(moulding, skirting boards, flooring and panelling) and exterior, as well as furniture and frameworks. It is also commonly used, when treated, for exterior fittings (cladding, exterior urban furniture). It is widely used for packaging, crates and pallet production, also for telegraph poles, fence posts and boatbuilding. Smaller sized logs with many knots or blemishes are usually chipped for particleboard or pulped for paper. The large volume of bark per unit of wood volume makes the tree especially suitable for production of mulch.

In addition to industrial uses, maritime pine is also a popular ornamental tree, often planted in parks and gardens in areas with warm temperate climates.

The bark of maritime pine is a source of flavonoids, catechins, proanthocyanidins, and phenolic acids; notably in the patented extract Pycnogenol. As a source of flavonoids, Pycnogenol is a natural antioxidant and anti-inflammatory that protects the body from harmful free radicals, helps boost the immune system and strengthens blood vessel walls and capillaries. Several other species of pine contain similar chemicals.

Originally *P. pinaster* was tapped, or the wood and bark distilled, for resin production. It was the most important source of resin in Europe. However, tapping has largely died out since WW2 although there has been a recent resurgence in Portugal due mainly to the high levels of unemployment and the increase in prices of resin in international markets (Anon., 2014). It was used to produce turpentine, pitch, oils, varnishes, waxes and soap. The components of resin, termed 'naval stores' were used in building and maintaining wooden sailing ships, and included cordage, turpentine, rosin, pitch and tar. The cones are widely sold for Christmas decorations.



Figure 4. *Pinus pinaster* being tapped for resin in Leiria, Portugal. (Photo: Dr Luis Fontes)

Pinus pinaster

The place of maritime pine in British forestry

Improved varieties of the species are needed with greater straightness and more resistance to pests and diseases. Because of its susceptibility to red band needle blight and potential attack from the pine wood nematode, its sensitivity to frost damage, and the scarcity of suitable sites (coastal, with acidic sandy soils), it is unlikely ever to become a major species in British forestry partly because other pines (e.g. Corsican and Scots) are better and faster growing. As Brown and Nisbet said in 1894: "The maritime pine possesses little silvicultural interest for Britain except as a means of forming woods for shelter along coast districts, so as to enable other species of crops to thrive better under their lee." The situation has not really changed in the ensuing 120 years.

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Since retiring from Oxford University in 2006, **Dr Peter Savill** has been involved as a Trustee of three charities: Woodland Heritage, the Future Trees Trust and the Sylva Foundation. He has also written *The Silviculture of Trees used in British Forestry* (2013) and edited *Wytham Woods – Oxford's ecological laboratory* (2010).

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