Monterey Pine

Monterey Pine (Pinus radiata) is a familiar sight near the coasts of Cornwall and Devon and the rounded spreading outline of older trees adds much to the local scene, particularly in winter, standing head and shoulders above other trees. Its distinctive large cones in clusters of three to five persist on the branches for many years. The density of the crown is attributable to bearing long needles in bunches of three. A strong feature is the deeply fissured bark on older stems.

Although frequently used here as an amenity or shelter tree, it is grown widely in many parts of the world for its rapid timber production, totalling some 3.5 million hectares of plantation, mainly in New Zealand and Chile, but with considerable areas in Australia, South Africa and in N.W.Spain, where climate and season are comparable to S.W.England.

Its native range is restricted to a few exposed rocky headlands and islands on the Pacific coast of California where the northerly cold ocean current creates heavy fogs rolling in from the sea, moderating the temperature of what is essentially a Mediterranean frost-free climate, at the latitude of Gibraltar.

Its salt tolerance, wind firmness and rapid growth, often averaging 20 metres in height in the first twenty years with a breast-height diameter of 50 cms, recommend it for planting in the Southwest. It is not frost hardy and growth rates decline with increasing elevation.

The extension of the leading shoot on younger trees is variable and it may make one, two or three spurts of growth within a single growing season, setting a terminal bud, and side-branch cluster, between each phase of growth, the last growth period being as late as October. This makes it difficult to estimate the age of Radiata by the normal method of counting the number of inter-nodal lengths of the stem. This polycyclism of the leading shoot can be influenced by a number of factors but usually ceases around the tenth year.

Successful establishment of Monterey Pine in background, failed lodgepole pine in foreground - heavily contaminated site. This photo demonstrates Monterey Pines ability to tolerate harsh conditions. N.B. Heathland sites may not be appropriate for planting.

Site Selection

While growth potential is obviously related to agricultural fertility a wide range of sites are suitable for adequate growth, including areas bearing gorse, which are frequently on thin exposed soils over rock. Wet sites are not suitable. This pine has been established very successfully on old minewaste sites and on contaminated land. Whenever considering planting any site an assessment of the site’s existing environmental value should be made to ensure that important ecological or historic features are not damaged. Landowners can check with the Environmental Records Centre, Allet, Truro and the Cornwall Archaeological Unit, County Hall, Truro.

Many of Cornwall's minewaste sites contain internationally important conservation interest as well as being proposed for listing by English Heritage and as part of a World Heritage Site. It is not the County Council’s policy to promote tree planting on these sites.
Site Preparation

Scrub growth and bramble should be removed, and here one is thinking not only of competition for soil moisture and light for the young trees but also unhindered access for tending operations for at least the first five years, so spraying may be more effective than mechanical cutting. No fertiliser application should be required. Spot spraying is necessary on grassland, a good square metre for each tree, as grass presents intense root competition and rainfall interception, taking nearly all available moisture during periods of drought. An alternative to spraying is the use of mulching mats, which are squares of plastic which cover the ground around the newly planted tree and suppress the competing vegetation. Hand-screening, using a mattock, is another method, but needs frequent repetition as the vegetation reappears.

Adequate fencing is required to exclude stock as both cattle and sheep will eat young trees. Rabbits can also cause extensive damage and consideration might be given to using small mesh netting to exclude rabbits if new fencing is required. The alternative is individual plastic protective netguards and the size of the area should dictate which is used, according to the economies of scale.

For further information about Monterey Pine and how to grow it visit the Forestry and Timber link above.

Planting - Initial Stocking

Old double row shelterbelt illustrating nature of the crowns and the loss of lower branches.

For shelterbelts a single row at 2m to 3m apart is perhaps sufficient when remembering that large lateral branches will develop spreading out on each side. If these become unwelcome and are then pruned the effect of low shelter will be lost and additional planting with another species may then be required. If there is sufficient width for multiple rows of trees consideration should be given to planting a secondary species, such as hawthorn or perhaps privet, to fill the space beneath the crowns of the ageing pines. This pine has a relatively short life, in tree terms, beginning to decline after about 70 years in conditions of exposure, compared to Evergreen Oak for example, which might thrive for two to three centuries. While Monterey Pine offers the benefit of rapid growth one must think beyond this when looking for longterm shelter or screening.

For forest planting a range of spacings can be considered. Firstly, it should not be mixed closely with other species, particularly broadleaved, as it will largely outgrow and suppress whatever is planted alongside it. Where it is to form only part of a mixed planting the pines should be confined to discreet groups or strips which will not interfere with slower growing species. Traditionally conifers have been planted at close spacing to achieve lateral branch suppression and to provide intermediate income from a succession of thinning operations. Such dense planting of Monterey Pine at 2m. has often not proved too successful, owing to a condition called 'the Yellows'. 
Young pine with only one year's healthy needles.

Photo of a Monterey pine tree with 'the yellows' disorder, which can begin to appear around the fourth year after planting.

This tree has 'the Yellows'.

This disorder begins to appear around the fourth year after planting, in February/March. Normally this pine will hold its needles for two to three years, but this condition is characterised by progressive yellowing and casting of needles, usually leaving only the last year's foliage unaffected. There is no known association with fungi or insect attack and it is thought that the condition is attributed to 'climatic stress', related to our sites being some 1000 miles north of where the species occurs naturally. Coupled with the effects of intense competition in a dense plantation, a third or more of the stems may die, giving the dominant trees virtual free growth, allowing the development of coarse side branches, which close planting and heavy shade were intended to suppress.

The condition of 'the Yellows' can frequently be observed also on large open-grown Pines in early Spring, when it is often misconstrued as winter storm damage, the yellowing needles turning orange and then brown before dropping. These isolated trees are also often reduced to one year's foliage but appear to grow just as vigorously as neighbouring, unaffected, trees.
Young pine in foreground with 'the Yellows'.

A recently pruned, young plantation at wide spacing

A recommended prescription, therefore, is to adopt a much wider initial spacing, of perhaps 3.5m to 4m. apart, echoing the practice in New Zealand and elsewhere, removing the unwanted side branches by manual high pruning and reducing the stand to final crop spacing in one thinning to waste. While this would forego any intermediate returns from thinnings it would also avoid the necessity of any further management after high pruning has been completed, some 10 to 12 years after planting.

**Planting**

One year old, cell grown seedlings.

Perhaps due to the low demand previous supplies of plants have tended to be somewhat erratic, offering rather weak bare-rooted 1 year seedlings or somewhat over-grown 1+1 transplanted stock, leading to high failure rates with patchy and disappointing results. Increasingly pot-grown plants have been available and, although more expensive, these have given consistent results and have the advantage of being transplantable at virtually any time of year.

More recently cell grown 1 year seedlings have become available with considerable advantage. This is a specialised form of pot culture which avoids the tendency of fast growing plants becoming 'pot-bound', with well-developed root fibre trained in a vertical direction only. These can be planted from mid-February onwards with good results and can be produced on demand within a one year regime. Being small, it is important to have a clean, weed-free planting site.

The root system of cell grown seedlings is contained in a root ball of compressed soil ramified by the roots and with care can be handled without causing any disturbance or interference, though they should not be allowed to dry out prior to planting. The planting operation is simply to make a hole large enough to receive the root ball and firm around it. Cell grown seedlings are frequently raised in plastic tunnels and may not be thoroughly hardened off when received. Consideration should be given to this, and to the degree of exposure of the planting site since, with a self contained rootball, the planting date can be delayed on either count.
With open rooted plants it is desirable that the roots are planted to give a natural spread to develop good anchorage, and not doubled back by thrusting them into the planting hole.

With pot-grown plants the root ball should be inverted in the hand and inspected prior to planting. If there are roots which have coiled round in the pot these should be teased out and pruned off so that an outward spread of new roots will be encouraged. The aim is a well spread root system to achieve windfirmness.

There are a variety of tree-guards and tree-shelters available but most of these have a forcing effect on pines, which is wholly undesirable. If there is danger from rabbit damage a tube of plastic netting is the best protection, having an open weave. A 46 cm tube is adequate. Rabbits will nibble off small unprotected seedlings, perhaps attracted by the soil disturbance, but once they have become established and have begun to grow out of the end of the tube the rabbits seem to become accustomed to their presence and lose interest in them, and often the tubes can be removed and used again after one season. The tubes should be supported with a stick, or cane, or by putting two or three divots against the base, but not by introducing the tube into the ground as a means of self-support, since the root system will grow outwards through the plastic netting which cannot then be removed without unduly disturbing the young tree.

This has been described in some detail since the stability of the young tree is a matter of much importance.

**Weed Control**

To encourage good root growth weed competition and shading should be avoided. If planting-mats have not been used and grass reinvades the site it should be sprayed, using a plastic sleeve to protect the tree. While rank weeds and bracken are cut with a hook this is the wrong way to tackle coarse grass, which will simply grow again quickly, needing to be cut once more, and so doing will use even more of the available soil moisture.

If there is dense bracken this should be cut three times a season. The first cut by mid-May is a quick operation, most of the fronds still being uncurled and succulent, and can in fact be quickly thrashed off with a stick. Another cut is required by late June and the third by early August. With strong growth of bracken this will need to be repeated in the second year, and perhaps some attention in the third. Bracken is susceptible to crushing and can be trampled flat as an alternative to being cut.

Young Monterey Pines are extremely susceptible to competition. They will continue to make their height growth, almost come what may, but if they are starved of light or nourishment by competing weed growth they will become spindly, and this must be avoided by adequate weeding.

Strong regrowth of bramble also represents a physical danger in that the leading stem and the foliage of young pines is extremely tender and easily damaged, or sawn off, by repeated wind-sway caused by rubbing against bramble, thorn bushes, or gorse. Generally soft herbaceous growth is not a problem, i.e. stinging nettle, foxglove, willow herb, thistles and the like.

**Beating Up**
Beating up is the term used for filling in any blanks that may occur due to failure of some trees to survive. This is effective if dead trees are seen and replaced soon after planting. If, however, beating up takes place a full year after initial planting these replacements never catch up and would tend to be removed at the time of thinning.

If 4 metre spacing were adopted this is four times as many trees as are required for the final crop and a few gaps are of no consequence, even if some are adjacent to one another. Infilling would only be justified if there would otherwise be large gaps in the stand.

Young pines blown by strong winds. Note 'sabre butts' below.

**Windblow**

For the first four years after planting young Monterey Pine is extremely susceptible to being blown over by the strong winds of the Southwest region. In part this is due to rapid growth and dense foliage, but this is an area of high wind frequency. Falmouth, for example, has on average 35 days a year when gale-force winds occur, compared to Dover in a similar coastal situation which has only 3 gale-force winds in a year.

It takes about five years of growth for these young pines to develop a root system large enough and tough enough to become firmly established, after which they are normally very windfirm. Good planting and adequate weeding will help to produce a stocky, well-rooted plant, but some windblow is inevitable, and in each year that this happens the young trees must be brought back to the vertical to avoid 'sabre-buts'.

Obviously, if a young leaning tree is left untended this will form a curvature in the butt length rendering it almost valueless where timber production is the objective.

In general staking should be avoided. The bark of young pines is extremely soft and damage is likely to be inflicted by the tree-tie, or by neglecting to loosen it with the passage of time. Furthermore, wind-sway promotes root development and the thickening of the lower stem, and if a stake has immobilised the tree and is doing the work of holding it up, this leads to lack of the very development that is required.

A well proved method of standing up young windblown trees (1) is to make a turf mound around it. First make the tree upright by treading some loose soil around the base. (2) Then, using a sharpened garden spade, a large sod should be cut, half-a-metre square, or two spade widths per side. (3) Placing it beside the tree, with the vegetation upwards, a slot is cut to the centre, and the sod then slid forward to encompass the tree, with the slot 'into wind' so to speak, i.e. in a westerly direction. (4)
By not inverting it this sod will take root and knit to the ground in a short time and provide support around the stem. Similarly by making the effort to produce one large sod, rather than four smaller ones stamped around the tree, this solid rooted mass of soil will start to give immediate support. If and when further wind sway produces an open funnel in the mound around the stem, perhaps not till the following year, allowing the tree to lean once more, fine soil can be poured into the funnel and trodden in to bring the tree upright again. Fine soil is specified, this means removing stones from the filling material, because the walls of the funnel have become compacted and if stones are poured in they will break the bark in the inevitable event of further movement. This is no more laborious than staking and it is effective, even with trees of two to three metres in height.

It will depend on when labour is available for this task but it should be completed by late April since shoot extension will then be taking place and the tree needs to be back in the vertical position by this time. If carried out in the earlier part of the winter it may well have to be followed up with further attention as successive gales have their effect.

Much depends on the exposure of the site, but even sheltered sites can be affected since here the trees will tend to grow even more rapidly and there can be a marked eddy and swirl effect in sheltered positions. Trees raised in individual tree-shelters are particularly prone to windblow, in part because the shelter has supported the tree and robbed it of the movement that is necessary to promote its stability, and partly because of the 'lollipop' effect of restricting side-branch development until it has grown above the shelter, with increased leverage on the root system.

By the end of the fourth year the trees should be around 4 m. in height, branched to the ground, and windfirm. If the odd individual is then windblown it should be discarded and no longer propped up, since, for whatever reason, its roothold is inadequate.

**Pruning**

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