

# PINUS CONTORTA as a Forest Tree in Ireland

By P. F. O'KELLY.

**F**ROM the point of view of artificially regenerating exposed infertile upland—heaths and moors *Pinus contorta* is the most valuable species, either exotic or indigenous, in national reafforestation at present. It was introduced together with *Picea sitchensis* and *Abies nobilis* into England in the year 1831 by David Douglas who was acting as collector for the Horticultural Society of London from 1829 - 1832 but it did not make its appearance in Irish State Forests until comparatively recent years—not before 1922 and perhaps as much as 3 to 5 years later.

Our oldest stands of *P. contorta*, on this account, do not exceed 30 years and the area of stands over 15 years is comparatively small. Our knowledge of its behaviour, therefore, is limited roughly to the first half of the rotation set down for it—50 years.

While I lack the benefits of a widely scattered picture of its behaviour on other soil types—my observations of this species are confined mainly to Kilworth and Ballyhoura Forests both of which overlie Old Red Sandstone with iron pan,—difficult sites, indeed, for any species—the stands of *P.C.* at Kilworth, will, in my opinion, compare favourably with other stands in respect of age, vigour, and quality and its performance on O.R.S. may be used as a convenient yardstick. I write, then, not as one professing to know all its possibilities, but in the hope that what I have observed will benefit those who, like myself three or four years ago, find themselves with large areas of *P.C.* at the pruning stage and are undecided what to do with them; whether, in view of its present rather low rating as a timber tree, it is worth the expense of pruning it or, having pruned it, will it be subject to wind throw if it is thinned. Further I wish to point out some of the pitfalls that should be avoided, especially in thinning, and to draw attention to some of its silvicultural possibilities.

*Pinus contorta*, otherwise known as Beach Pine—this being the dwarf form of the barren soils of the windswept Pacific Coast—or Lodgepole Pine, the tall form of the mountains further inland and so called from the fact that it was used by the North American Indians to support their tents, is indigenous along the Pacific seaboard of the U.S.A. to the states of California and Oregon; it is abundant on the Cascade Mountains, along the banks of the Klamath and Columbia rivers; it is found also on the pumice plain between the Klamath Lake and Des Chutes River. The tall form variety *Murrayana*, is the one in general use in Ireland.

*Pinus contorta* (Douglas) Synonym *P. Boursieri* (Carrière) is an evergreen tree, of moderate or small size, of comical outline, with numerous sub-erect or spreading branches. In its young state it is a compact pyramidal, densely branched tree well furnished with a grass green foliage. The specific name **CONTORTA** was probably suggested to Douglas as Dr. Newberry (Pacific Railway Report) suggests by the appearance of some of the dead trees on the pumice plain between the Klamath Lake and Des Chutes River. It belongs to the *binæ* group of

pinus and is classed as a hard pine with *sylvestris*, *laricio*, *densiflora Thunbergii*, etc. It has small leaves  $1\frac{1}{2}$ " - 3" long, closely resembling those of Scots Pine (*P. sylvestris*) but of a brighter shining green, slightly twisted and ending in a sharp point. The variety *Murrayana* has longer leaves which are also more twisted. The buds are brown in colour, very resinous, cylindrical with a sharp tapering point. The cones are ovoid or conical about  $1\frac{1}{2}$ " long and persist for several years. The branches which have long and short shoots are borne in whorls of six to eight—generally six. Bark is thick and varies in colour from a greyish green to dark brown, much fissured and sometimes flaky towards the base of young trees and very hard.

As nursery treatment varies so little for most of the pines the following remarks will suffice in this respect. There are roughly 78,000 seeds per lb. and the germinative capacity is something around 60 per cent.; thus production per lb. at 1 year will rarely exceed 45,000 plants for broadcast sowing in beds and 35,000 to 40,000 must be considered an excellent result. A medium tilth and light covering is all that is required for sowing the seed which takes from 3 - 6 weeks to germinate. One-year-one transplants are considered best but I suggest that seedlings and transplants be graded rigorously in an effort to avoid having an uneven canopy which is a feature of quite a number of P.C. stands.

Excellent results have been obtained by mound draining along the contours at 6 or 7 yards apart,—and picking of the retentive peat with mattocks before setting out the turves has proved beneficial. The turves should be trampled to make them settle and a period of six to nine months weathering, to allow injurious humic acids to be washed out of them, should not be overlooked. However, mounded areas should not be left unplanted longer than 12 - 18 months as there is a considerable washing away of the soil after that time. The need for intensive mound drainage with the contours cannot be overstressed as this brings about a firm soil which in turn generally results in a straighter crop. Planting in pits seldom gives results nearly as good as planting on turves and even on the better types of heath mound draining and turving eventually will re-pay the extra cost.

Sometimes areas are mounded by cutting the turf and placing it alongside the resulting shallow pit; this method, while it is considerably cheaper than mound draining and setting out turves, is not to be recommended since the shallow pit is generally water-logged all through the winter and often for periods during the summer, thus checking growth in the initial years and later in my opinion causing a number of the stems to lean.

Planting with seedlings on turves, (of which there is a really good example in a seventeen year old stand in Compt. 49, Kilworth Forest), is an excellent idea. There may be a danger of the seedlings being thrown out of the mounds by frost during a severe winter but since the cost of seedlings leaving the nursery is considerably lower than the cost of one-year-one or older transplants and since seedling planting in ploughed turves reduces planting costs considerably it may be cheaper to fill

any blanks resulting from frost throw or failure than to plant with transplants in the beginning. Needless to say if the initial cost of establishment can be reduced it will further enhance the value of the crop. Seedlings to be used for planting should be graded, only those with a "neck of timber" being used for planting out on mounds.

Planting on mounds can be done both cheaply and quickly if the following method be adopted. The gang or squad of men, using wide spades, slit the mounds roughly half-way across and prise one side of the cut upwards. When it is considered that a sufficient area of mounds has been slitted one man for every seven or eight men in the gang continues slitting and the remainder with plants in buckets or planting baskets commence to plant. One man unencumbered with spade or dibbling stick can plant between 1,200 and 1,600 plants per day while it is doubtful if he will plant more than 800 per day if he slits and plants all in one.

On areas where iron pan is present and where it lies below the depth of the soil working it may be possible to reach it and break it by driving a crowbar into the ground directly under the turves.

My observations at Kilworth suggest that of the variety *Murrayana* (the tall form) there appears to be two types—one, a sub-erect branching type and the other a spreading-branching type. Of the two the sub-erect branching type at Kilworth at any rate, has given far better results than the spreading branching type, although it must be admitted that the spreading-branching type can suppress and kill heather, etc., at wider spacings than the former but it has a higher percentage of crooked and leaning stems and a more uneven canopy. However, in firm well drained sites both types as a rule will have more than sufficient straight stems to form a final crop but the workability of straight thinnings should not be overlooked if a choice is feasible. The sub-erect type will have few if any crooked stems after first thinning and more important still it will have a more uniform canopy. Planted on turves at 4' x 4' the sub-erect type closes canopy in vigorous stands as early as 12 to 14 years and eliminates all growth on the floor of the stand, while the spreading branching type, at 17 years usually has a very uneven canopy—from 3 feet to 35 feet—with strong growths of heather furze and *molinia* in patches where the canopy is open but this may in part be due to lack of mounding and insufficient drainage.

It may be necessary to prune *Pinus contorta* as early as the fourteenth year and in addition to dead and suppressed stems all the very crooked stems should be removed in the weeding. Pruning costs for the sub-erect type planted at 4' x 4' are considerably lower than for the spreading type planted at 5' x 5'. One may say that an extra foot does not make much difference but when it is considered in growing space it amounts to the difference between 16 sq. feet and 25 sq. feet and it is only then that one sees the difference in its true perspective, but a reduction in establishment costs due to wider spacing (less plants being used) should offset any extra pruning costs that are not excessive.

First thinning should be carried out when the co-dominants are 25 feet high. This will consist of removing, as many as possible of the

leaning and crooked stems that remain after weeding together with wolves and forked co-dominants, but for the sake of soil protection some of each of those three classes must be left standing. Occasional groups of straight stems will also need to be opened up. The grade of thinning would be moderate to heavy according to the condition of the stand. It is very important even at the expense of making gaps to remove as many as possible of the crooked and leaning stems in the weeding and first thinning since they have the unfortunate habit of causing, not one, but several of their immediate neighbours also to lean and considerable damage can be done to a young crop in a short period of years. Eventually they cause large canopy gaps on the side away from the lean and in a fast growing crop like P.C. it requires quite a lot of courage to deal with them if their removal is delayed. As many as possible of the wolf trees too, should be removed in the first thinning; their rate of growth oftentimes equals that of Sitka Spruce and these become progressively more difficult to deal with if they are allowed to remain. Likelihood of new growth on the floor of the stand after a moderate to heavy first thinning should not cause undue worry—the thick carpet of needles generally has subdued all but the most persistent growth and the rapid growth following thinning and consequent canopy formation together with fresh needle cast should deal effectively with these in a very short time.

Second thinnings in vigorous stands may have to follow in as short a space as 2 years and should prove to be a comparatively simple operation if the first thinning was carried out on the lines suggested.

So far, in Kilworth, thinning has not resulted in wind throw—stands thinned in 1951 stood up surprisingly well to the December 1951 storms—whereas trees allowed to spindle have been observed to snap in a storm like *Abies grandis*. Until more information is collected about this species it would be wise to thin as early as possible on the lines suggested and to continue thinning frequently. For experimental purposes a few plots might be given various grades of thinning at longer intervals.

From figures based on a 1/10 acre triangular plot in Compt. 49 the stocking of the sub-erect branding type (planted in 1935 on turves at 4' x 4' spacing) after first thinning (February 1952) are as follows: 2,030 stems per acre standing and 590 stems per acre removed as thinnings. Average stem measures 28' x 34" B.H.Q.G.O.B. Selecting .3 as a suitable form-factor this gives an O.B. volume of .7329 cubic feet per stem—say .75 for ease of calculation. For safety, assuming the stocking to be 2,000 stems per acre this gives an O.B. Volume of 1,500 cu. ft. per acre standing at 17 years. Volume O.B. removed as thinnings is estimated to be 430 cu. ft., 64 per cent. of the stems removed lying between 4" and 7" basal diameter. This gives a result of 1,930 cu. ft. per acre at 17 years! The above results are obtained from a site on which a CP/SP crop was a dismal failure!

A word of warning here may not be amiss. The thick carpet of needles on the floor of P.C. stands forms an extremely acid humus which shows little or no signs of decomposing. The downwash from this acid

humus may accelerate podsolisation on poorly buffered soils. Groups of Mountain Ash (*Sorbus Aucuparia*) and Birch (*Betula alba*) which produce a mild humus where they could be introduced would be beneficial in counteracting this tendency.

A very notable feature of P.C. at Kilworth and one which I suggest is worthy of attention is its ability to stimulate retarded crops of other species growing either in mixture with or in close proximity to it. On several sites which originally carried retarded crops of CP/SP suffering badly from exposure and saw-fly attack—in fact they were barely living—the S.P. when the P.C. got above it stirred to new life and in a few years began to show a marked difference in vigour and health, and, what is still more amazing proceeded to keep pace with the P.C. in height growth. There are scattered S.P. stems—the relics of the original CP/SP planting—in several of the P.C. stands in Kilworth. They grew from 4' - 6' or thereabouts in the first 8 years but are now keeping pace with the P.C. their total height being 25 ft., an increase of 19 ft. to 21 ft. in 17 years!—a truly amazing performance for S.P. on those poor sites. And since it benefits Scots Pine in check it might be worthwhile to experiment with it as a stimulator in retarded crops of S.S., N.S., and D.F.

A Scots-contorta mixture, however, requires attention very early in life to give the Scots more crown room and very early thinning must be resorted to to prevent spindling of the Scots Pine. To overcome this disadvantage strip planting might be tried out. That the mixture has many advantages cannot be gainsaid; most important it increases the height increment in the Scots Pine and having done this it should provide an intermediate yield of income from thinnings at a very early stage thereby reducing the carrying costs on a crop—Scots Pine—which at best is barely economic on quite a number of sites.

Pinus contorta can be grown successfully in mixture with Sitka Spruce on exposed molinia sites. Both of them stand exposure well and it will be interesting to see how these two exotics react silviculturally in mixture.

Its ability to stand exposure should make it an ideal windbreak for the more valuable species like S.P., S.S. and N.S. and its ability to subdue rank heather and furze quickly might be utilised to introduce other species in groups after opening it up. In frost hollows on tree-less sites it might be used as a nurse to be removed after the crop it protects has grown above the frost level and on the borders of light canopied crops it could be used to subdue rank growths quickly and thus reduce the fire risk. Lastly it might be considered from the point of view of its ability to regenerate itself naturally, especially if some sort of soil preparation were resorted to in narrow blanks between older stands.

Hitherto Pinus contorta was regarded as the poor relation of all our forest trees—a mere peg or two higher in the social scale than Mountain Pine. Without it, however, much of the land, now considered suitable for re-forestation, would be regarded as a liability to the Forestry Division in particular and to the nation as a whole. But it has proved itself to be a volume producer of no mean ability on poor soils and its silvicultural value is further enhanced by its other possibilities. All that

remains then to put it in general favour is to establish that its timber is capable of being used for purposes similar to those for which S.P. and the Spruces are now in general use.

I have used light P.C. poles for bridging a small stream over which a loaded tractor-trailer was passing several times each day during road repairs. They bent considerably under an estimated 6 ton load but they did not break, and they stood up to weeks of crossing and re-crossing of heavy loads. I have also used about 20 P.C. fencing stakes for re-staking during fence repairs but as they are only a year or so in the ground I cannot say what their life expectancy will be.

Lastly I had a short log of P.C. var. Murrayana, sub-erect branching type, hewn and air-dried and took it to a local building contractor who considered it on a par with, if not superior to some of the imported white deal he was using, which, however, I must admit, was of a poor quality sawn from logs of small diameter.

"*Pinus contorta*" according to the Cameron report "will undoubtedly produce important pit-prop availabilities and a large volume of round-wood suitable for sulphate pulp and fibre-board manufacture, but there is some doubt that it can be expected to make an important contribution to the commercial saw-timber needs of the country." On the other hand Edlin says "that it is not durable but is suitable for general carpentry and constructional purposes" and Buttrick mentions that it is used in the central American States as railway sleepers.

Speaking at a recent meeting of the Society Mr. Mangan said the Electricity Supply Board had made a trial of P.C. for transmission poles and found that its absorption of creosote was so much more than that of the commoner species as to make the treated pole almost as dear to them. An examination of the end grain of stumps at Kilworth shows the timber to be either open or close grained according to situation and growing space and the timber itself to be very resinous. In large dimensions, and at Kilworth there are several trees girthing 36" O.B. it should be useful at least as wall plates, collars, ridge boards, etc.

Based on measurements taken in 1/10 acre plots selected more or less at random from areas unthinned, after first thinning and after second thinning the following particulars should be of general interest. Compartment 26 got its second thinning 1952; largest stem is 50' x 10 $\frac{3}{4}$ " B.H.Q.G.O.B.

Compartment.	Age.	Stocking per acre	Height of dominants.	Average B.H.Q.G.O.B.	No. of poles removed as thinnings.
50	17	2,320	25'	3 $\frac{1}{4}$ "	—
49	17	2,030	28'	3 $\frac{1}{4}$ "	590
49	17	1,960	28'	3 $\frac{3}{4}$ "	410
26	22	510	45'	6"	210

#### REFERENCES :

1. *A Manual of Coniferae* (Jas. Veitch & Sons, 1881).
2. *British Woodland Trees*. H. L. Edlin.
3. *Report on Forestry Mission to Ireland*. D. Roy Cameron.
4. *Forest Economics and Finance*. Buttrick.