Some Effects of a No-Thinning Regime on Forest Management

J. C. L. PHILLIPS

District Forest Officer, Castle Barracks,
Wellington Place, Co. Fermanagh.

SUMMARY

The Northern Ireland Forest Service has adopted a no-thinning policy for Sitka spruce on most areas of peat and gley soils due to experience of early windthrow following thinning both in Northern Ireland and elsewhere on such sites. The reasoning behind this decision is explained and its effects on such aspects of management as production timing, employment, road construction, recreation, conservation, landscape values and the work of the forester discussed.

1. INTRODUCTION

Before looking at the effects on management of a "no-thinning" regime it is perhaps necessary to explain why the Northern Ireland Forest Service does not intend to thin some 73% of its forest area. The thinking behind this decision is largely covered in a paper by Mackenzie (1976). The likelihood of windthrow is known to be related to a number of factors and in the paper a wind risk assessment was built up using data from 921 plots and took into consideration soil, slope, aspect, altitude, exposure (topex) and geology. This assessment showed that 14% of the plots were classified as being at very high risk and 54% at high risk.

1.2 *Exposure*

Further evidence of our exposure problems can be gleaned from a paper describing work on tatter flags by Savill (1974). Here the results of long term tatter flag experiments are given showing that on Ballintempo Forest, Co. Fermanagh, an area typical of much of our high elevation forest land in the west, the mean daily flag loss was 6.8cm^2 and at Beaghs in north Antrim the rate averaged 7.8cm^2. Even at much lower elevation, some 70m above sea level, at Castle Archdale, Co. Fermanagh the average daily loss was 6.6cm^2 (Jack and Savill 1973).

As a result of extensive work on tatter flags by the Forestry Commission in Scotland and northern England summarised by

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Booth (1978) an exposure classification is suggested in which a means daily tatter rate of between 6.6 and 10.0cm^2 is regarded as "very exposed".

1.3 *Soil*

Shallow rooting increases the liability of a crop to windthrow and rooting depth is often restricted by wet soils (Savill 1976). Gleys and shallow peats are probably the worst in this respect. Deep peats, unless adequately drained, and we have not yet found a completely satisfactory method of doing this also often restrict rooting severely. There is some evidence that lodgepole pine, growing reasonably vigorously will effect considerable drying of deep peat, even to the extent of causing peat cracking in some cases, but there is no evidence that Sitka spruce can do so and most of our wet soils are planted with Sitka spruce. In Northern Ireland, 25% of the forests are on peaty gleys, 15% are on surface water gleys, 10% are on shallow peat and 26% on deep peat — a total of 76% of our forest area. Soil conditions therefore also point to a high risk of windthrow in Northern Ireland.

1.4 *Windthrow hazard classification*

A system of windthrow hazard classification has been developed by Booth (1977) in which he uses wind zones drawn from Meteorological Office and tatter flag information plus the factors of altitude, exposure (topex) and rooting related to soil type to classify sites into six hazard classes. For each class the top height at which the onset of windthrow is likely to occur is suggested. In Northern Ireland about three quarters of our woods fall into the three most severe hazard classes where windthrow begins between 10m and 16m top height. The windthrow considered here is that caused by our routine winter gales of 40 to 60kts, not by our occasional severe storms. From the papers mentioned above and our own experience frequent plough scores restrict rooting and increase the danger of windthrow. Many gleys were ploughed with single mouldboard ploughs at 1.8m intervals giving a high degree of root restriction.

2. THINNING/NO-THINNING

Thinning increases the risk of windthrow (Mackenzie 1974 and Booth 1977). Booth in fact suggests that one can achieve an extra 3m top height before the onset of windthrow by not thinning. The increase risk from thinning arises from two main causes: the general opening of the crop with the associated loss of mutual shelter and exposure of larger areas of individual crowns and by the cutting of the intense racking systems necessary for modern machinery and the damage to soil structure and tree roots caused by these machines.

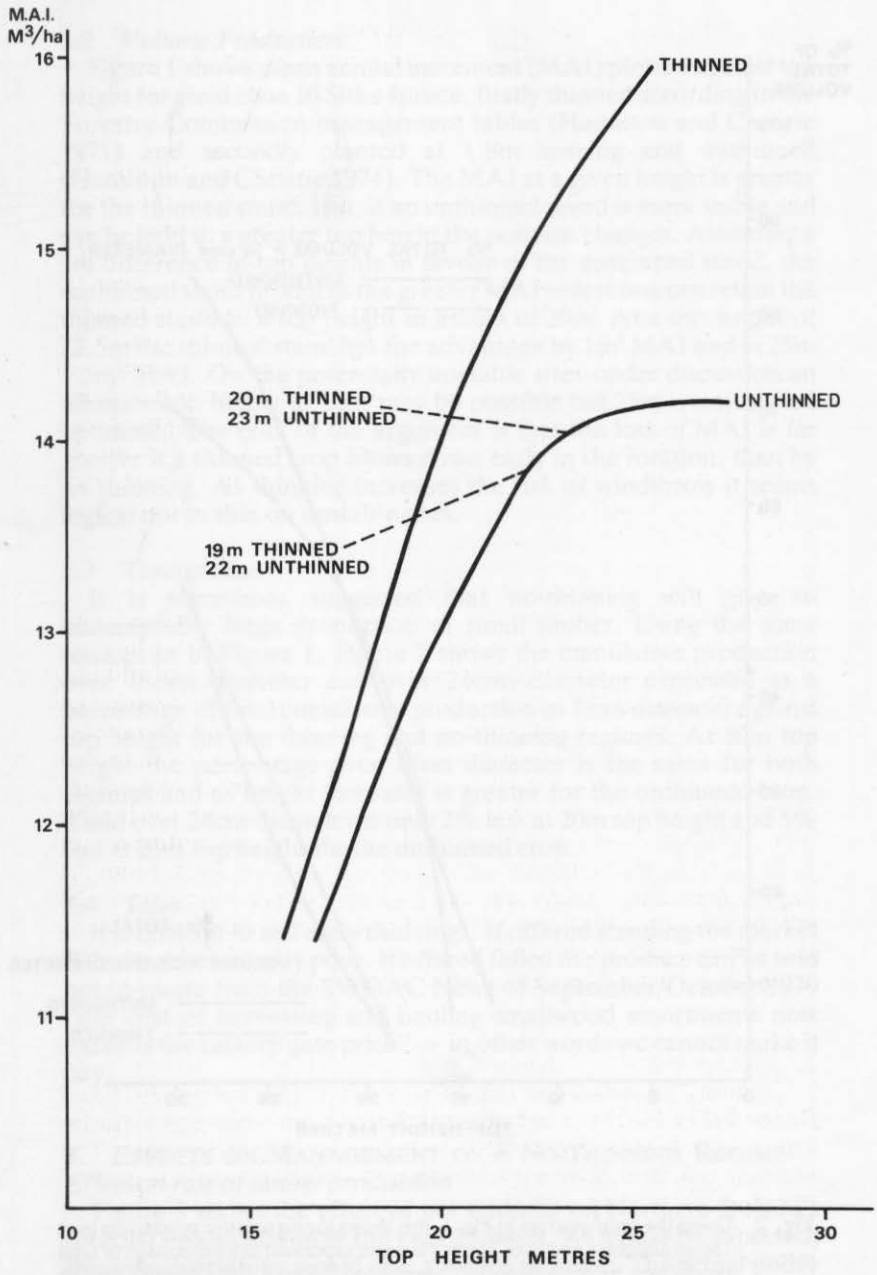

Fig. 1 Mean annual increment (MAI) plotted against top height for yield class 16 Sitka Spruce, firstly thinned according to the Forestry Commission management tables (Hamilton and Christie 1971) and secondly planted at 1.8m spacing and unthinned (Hamilton and Christie 1974).

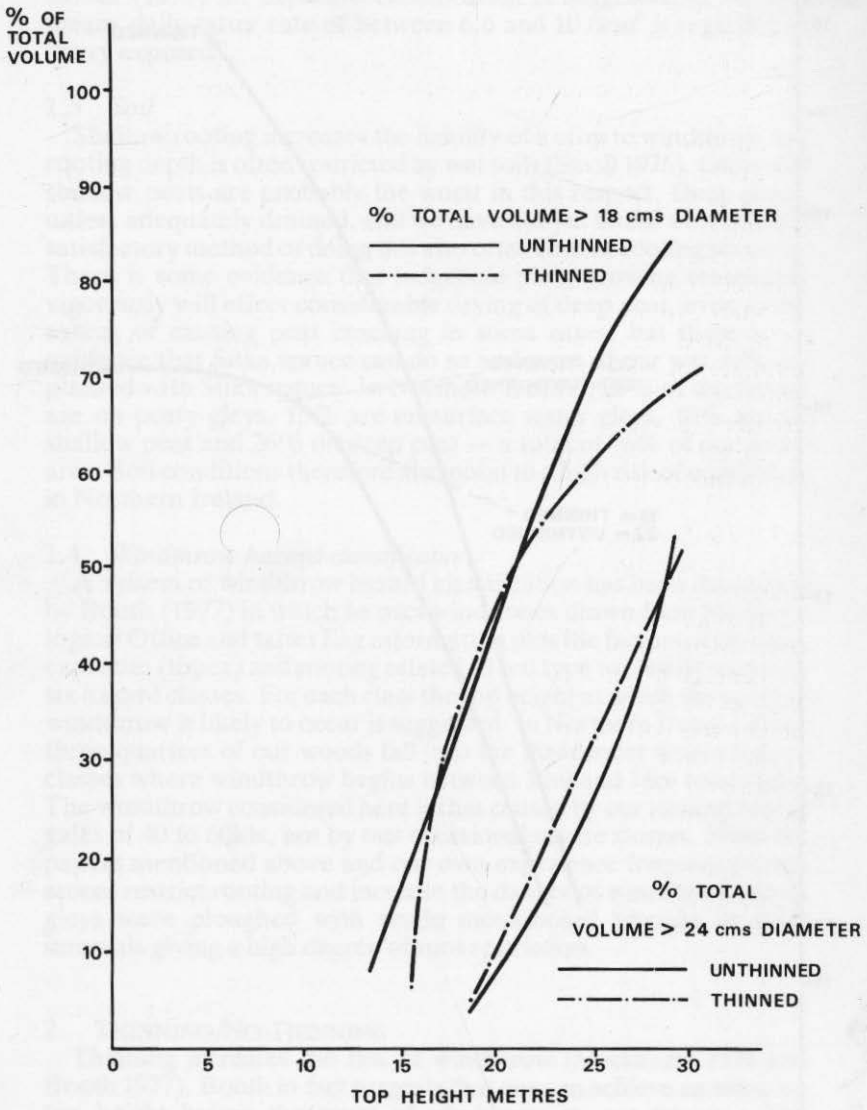

Fig. 2 Using the same sources as Fig. 1, this shows the cumulative production over 18cms diameter and over 24cms diameter expressed as a percentage of total production to 7cms diameter, against top height for the thinning and no thinning regimes.

2.2 *Volume Production*

Figure 1 shows mean annual increment (MAI) plotted against top height for yield class 16 Sitka spruce, firstly thinned according to the Forestry Commission management tables (Hamilton and Christie 1971) and secondly planted at 1.8m spacing and unthinned (Hamilton and Christie 1974). The MAI at a given height is greater for the thinned stand. But, if an unthinned stand is more stable and can be held to a greater top height the position changes. Assuming a 3m difference in top heights in favour of the unthinned stand, the unthinned stand produces the greater MAI unless one can retain the thinned stand to a top height in excess of 20m. At a top height of 22.5m the thinned stand has the advantage by $1m^3$ MAI and at 25m $1.5m^3$ MAI. On the potentially unstable sites under discussion an ultimate top height of 20m may be possible but 25m is unjustified optimism! The crux of the argument is that the loss of MAI is far greater if a thinned crop blows down early in the rotation, than by no thinning. As thinning increases the risk of windthrow it seems logical not to thin on unstable sites.

2.3 *Timber Sizes*

It is sometimes suggested that no-thinning will give an unacceptably large proportion of small timber. Using the same sources as in Figure 1, Figure 2 shows the cumulative production over 18cms diameter and over 24cms diameter expressed as a percentage of total cumulative production to 7cms diameter against top height for the thinning and no-thinning regimes. At 20m top height the percentage over 18cm diameter is the same for both regimes and as height increases is greater for the unthinned crop. Yield over 24cm diameter is only 2% less at 20m top height and 5% less at 25m top height for the unthinned crop.

2.4 *Sales*

It is difficult to sell early thinnings. If offered standing the market in Ireland is currently poor. If offered felled the produce can be sold but to quote from the SWOAC News of September/October 1979 "the cost of harvesting and hauling smallwood assortments now exceeds the factory gate price" — in other words we cannot make it pay.

3. Effects on Management of a No-Thinning Regime

Effect on rate of timber production

Figure 3 shows the effect of not thinning on Northern Ireland's forecast production over the next 25 years. As would be expected, thinning everything would give a steady increase. The actual policy of not thinning 73% of the forest area depresses production by

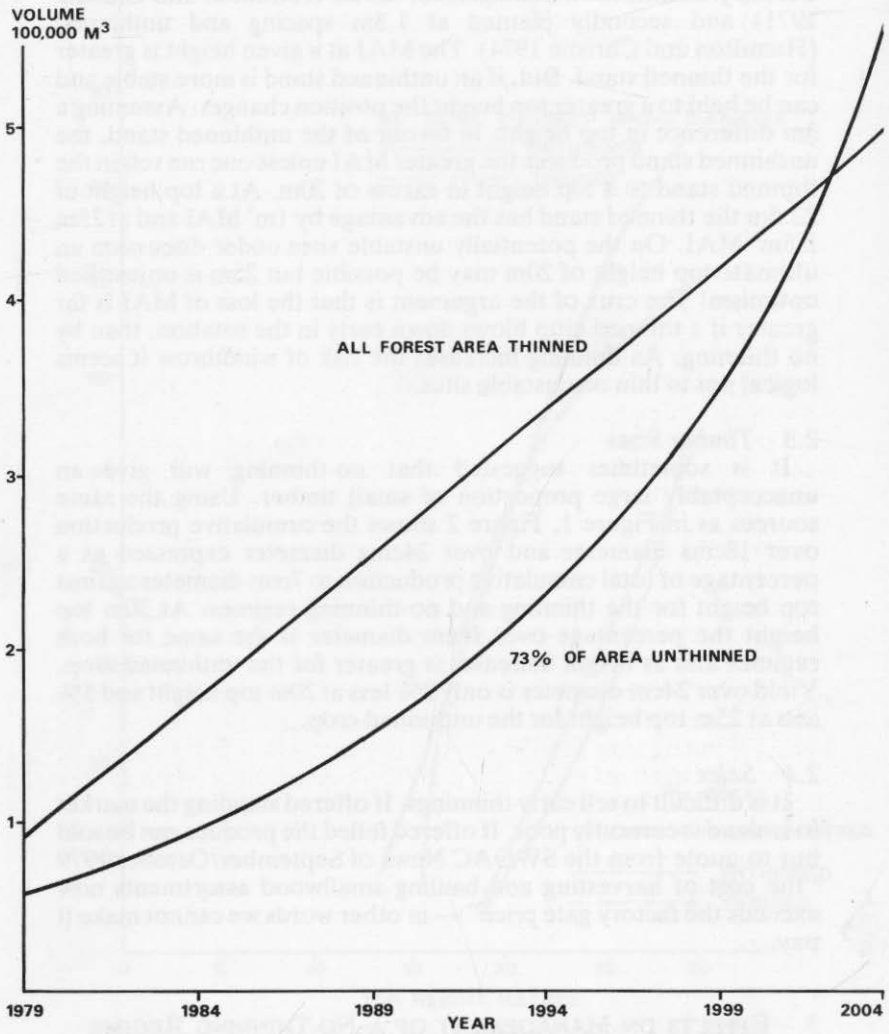

Fig. 3 Shows the production forecast for Northern Ireland in the actual situation of having a no thinning policy over 73% of the forest estate, compared with the production to be expected were the whole area to be thinned.

between 50,000 and 100,000m^3 per annum from 1984 until the end of the century when production from this policy rises rapidly and exceeds that from a thinning regime. Such a rapid increase may be desirable as it allows a boost to supply new industry without having to resort to early felling or some such device likely to produce a loss of potential MAI.

There are of course concomitant dangers. By not thinning there is more timber on the ground. An indication of the extent of this is given in Figure 4 which shows the standing volumes which would occur over 16m top height assuming felling at 40 years of age and Yield Class 16 Sitka spruce thinned and unthinned. These criteria are applied to the age class structure of the Northern Ireland forest estate. This demonstrates that from 1980 to the end of the century there is some 70% more timber at risk from windthrow with the no-thinning regime compared to conventional thinning.

3.2 *Labour and Roads*

The prospect of an extensive windthrow in these circumstances could be made even more serious by two other factors. The first is the availability of trained labour to deal with such an emergency. In a thinning situation the higher annual production over the next 20 years would mean a reasonably large production labour force. In a no-thinning situation production and therefore the labour force is smaller. Figure 5 shows the likely extent of this difference which could amount to between 25% and 35% and could make the problem of tackling extensive windthrow more difficult. The second factor is the provision of forest roads. The economists always advise us to leave the construction of forest roads as late as possible to reduce interest charges. With thinning one has an extraction road network available in all areas of the crop at risk from windthrow. In a non-thinning situation the economists advice would tempt one to leave the construction of the extraction roads until immediately prior to clear felling. If one did so and was caught by extensive windthrow there would be no road network for extraction and no time to construct one before the timber deteriorated. To me, this is an unacceptable risk and I feel that even in a non-thinning situation one must ensure that crops at risk to windthrow are adequately roaded.

3.3 *Access*

Because unthinned plantations are normally unbrashed there is a problem of access to the woods. The importance of this problem and some of those mentioned later is not easy to assess in quantifiable terms. However because the plantations are impenetrable except along roads and compartment boundaries there is a danger that pockets of windthrow, outbreaks of disease,

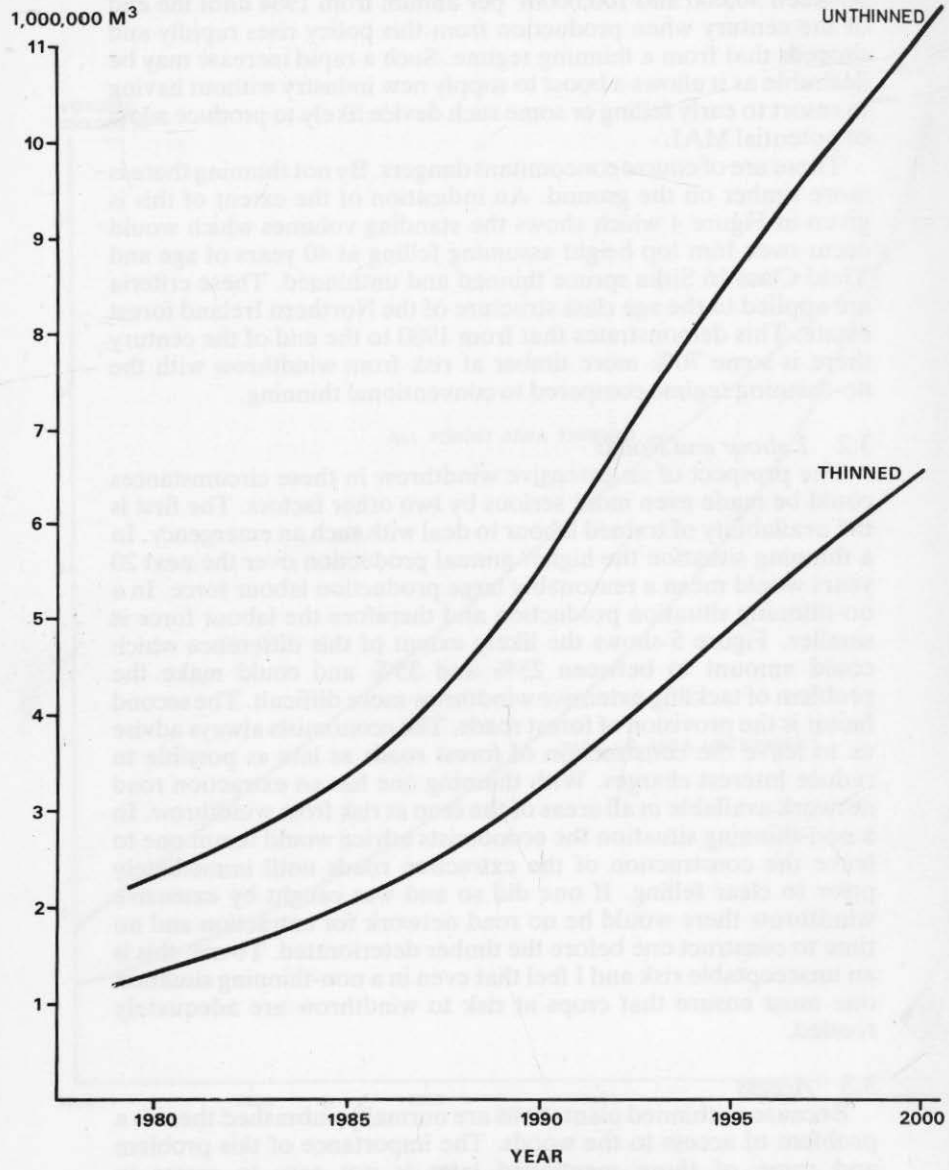

Fig. 4 Shows the standing volumes over 16m top height which occur given the area and age class structure of the Northern Ireland Forest Service estate, assuming that this were all composed of Sitka spruce yield class 16 and final felling was at 40 years of age.

areas of nutrient deficiency, blocked drains and other damage will not be noticed as quickly as would be desirable.

3.4 *Recreational Value*

While the public can have access to roads and rides they cannot walk through unbrashed woods nor can they even see into them. Walking along a closed sided green tunnel is not an interesting or attractive proposition. An unthinned spruce wood is not a pleasant environment to be in.

3.5 *Wildlife Conservation*

While I know of no work which is directly related to unthinned woods, an unthinned spruce plantation will have virtually no ground flora once the canopy closes. However unless a thinned crop is grown to 25m or more the flora is minimal anyway so the loss may not be great. I am not competent to suggest the effect on insects or minor soil fauna. The effect on birdlife is perhaps more predictable. In a recent paper on woodland song bird populations (Moss 1978), breeding song bird species diversity is shown to be related to foliage height diversity, i.e. the depth of the tree crowns and the presence of herb and shrub layers in addition to the tree canopy. If we only have a tree canopy layer, and a shallow one at that, the diversity of bird species will be less than in a normally thinned plantation.

If a no-thinning policy is adopted it therefore becomes all the more important to enhance the wildlife habitat value of the forest in other ways: by creating habitat diversity through leaving unplanted areas such as wide rides, stream sides and lake margins. Patches of natural scrub should be retained and tree species variety introduced using native species where possible.

3.6 *Landscape*

We are constantly being urged to make our plantations fit into, rather than obliterate natural landscape features. This involves the shaping of exterior and interior boundaries which can be done as well with no-thinning as with thinning regimes. It also frequently entails using species changes to emphasise landscape features, such as glens of hardwoods or areas of contrasting foliage colours from species such as larch. Many species cannot be satisfactorily grown without thinning and if they are surrounded by a matrix of unthinned spruce it will be difficult and probably uneconomic to give them the attention they require. The temptation will be to forget them to the detriment of their amenity value as well as the loss of their production potential.

3.7 *The Work of the Forester*

Many of us regard thinning as one of the most rewarding and

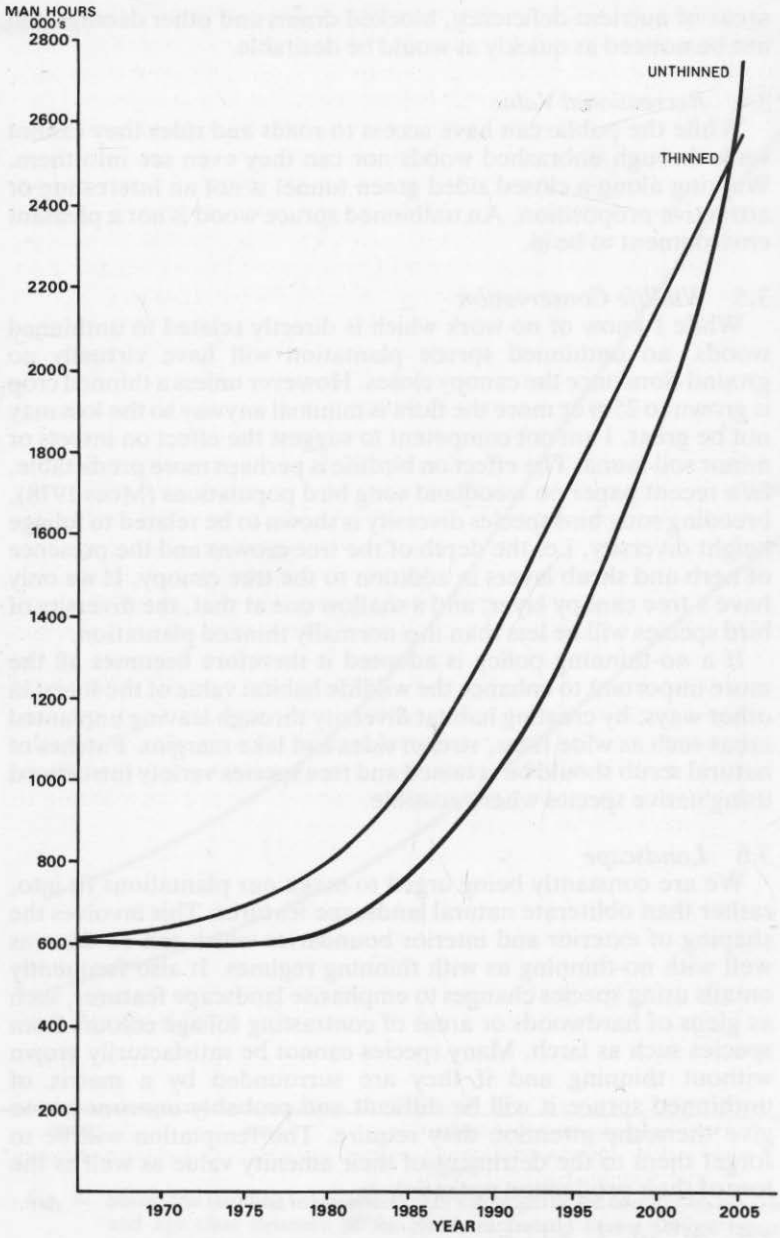

Fig. 5 Shows the estimated labour requirements of the Northern Ireland Forest Service in a thinning and no thinning situation using historical day rate outputs.

satisfying of tasks. It is a facet of tree culture we enjoy. To be denied the chance to carry it out and to be denied effective access to much of the woodland under our control does not help morale. Many foresters have regarded establishment as a necessary and somewhat tedious pre-requisite to what they see as our real raison d'être — the production of timber. Faced with having to wait 40 years instead of 20 years before production starts, which means in many cases leaving the harvesting to our successors, we can feel cheated of seeing the results of our labours. There is often also a sneaking suspicion that in accepting no thinning we have taken the easy option to avoid a problem we should have tried harder to solve.

4. Current Trends

Here I am thinking only of Sitka spruce which will remain our principal commercial forest tree. I think sheer economic pressure will prevent a return to a thinning regime on peat and gley sites. Planting spacing has been widened to some 2,000 plants per hectare. We could opt to plant somewhat closer than this and accept respacing before canopy closure to get the benefits of quicker vegetation and a degree of selection. However opinions on the economics of respacing vary. Recently Edwards and Grayson (1979) have suggested that the economics are dubious if the original crop spacing lies between 1.8m and 2.4m as the majority of the recent plantations do. Against this Savill, from work in Northern Ireland suggests that at 1.8m spacing or 3,000 plants per hectare, respacing to 2,000 stems per hectare could be justified at least on the higher yield class sites. There are considerable areas in Northern Ireland of a suitable age for respacing and we are considering to what extent it should be carried out.

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