PINUS RADIATA SITES AND LAND FORM.

by A.L. Clifton

In the northern divisions, there are 4 land-form types which have considerable bearing on the distribution of P. radiata plantation sites. This will shortly be demonstrated, but first, a comment on the requirements of P. radiata.

It is generally recognised that P. radiata plantation sites need to be on soils derived from rocks relatively high in ferro-magnesian (dark coloured) minerals in order to give a fairly high nutrient content. However, pines require more than mere nutrient. The soils should have depth for anchorage and the ability to store the large quantities of moisture demanded by an actively growing stand of pines.

It will be seen, then, that steep rocky slopes even if high in nutrients, can be expected to have only poor moisture retention. This is due to the effect of accelerated erosion on steep slopes, leaving only shallow soil. Such steep slopes as these occur along the face of the Darling Ranges. The traveller on the South West Highway will quickly observe that this area is suitable only for light pasture. If, however, he were to go into the hills, following valleys he will find in a few miles that steep slopes are less prevalent. This is particularly noticeable in tributary valleys. Larger trees will be seen growing in dense stands. It is in such localities that the best plantation sites are likely to occur.

Going still further up the valleys, the sides will become dominated by long, gentle slopes of gravel colluvium, mixing with the better soils of the medium slopes.

The valleys will ultimately terminate in the gently undulating ancient laterite plateau.

Summing up, it will be seen that the valleys have formed on watercourses, first cutting through the laterite cap, then down into the country rock. The present-day effect can be observed in four stages. I will refer to these as "erosional phases", and these are the land-form types referred to above.

Phase (a). Laterite - massive ironstone and gravel. Unsuitable for P. radiata.

Phase (b). Laterite undercut resulting in long, low spillways of lateritic detritus, on gradients commonly up to 1 in 7. (Steeper spillways do occur). Unsuitable for P. radiata.

Phase (c). Medium slopes. 1 in 7 to 1 in 3 gradient. Soils on these slopes are normally formed directly from underlying rock. Most pine sites occur in this zone.

Phase (d). Steeper slopes than 1 in 3. Normally, rocky, shallow. Some pine sites but mostly unsuitable, as at the face of the Darling Scarp.

Naturally, the limits given for each phase are not rigid, and there will be considerable overlapping. Some ironstone gravel will be found contaminating phase (c) soils, but this is usually in transit down-slope through the surface layers. Deeper seated gravels in quantity may occur on the gentler slopes of (c) phase and these usually indicate soil deterioration. The gravels can be forming in the soil, or merely accumulated lateritic colluvium. In either case their presence in quantity indicates static land-surface conditions, which in turn are associated with age and leaching of nutrients.

Only where underlying rocks in the (c) phase are high in nutrient bearing minerals are the soils derived from them likely to be suitable for P. radiata e.g. basic* and intermediate rock types are better than acidic* types.

It should be noted that soils derived from acidic (e.g. granite) parent materials are more subject to erosion, leaching, (Podsolisation), and gravel formation (lateritization) than are 'basic' soils. Granite outcrops are frequently found on slopes of only 1 in 5 whereas basic-rock types rarely outcrop until slopes exceed 1 in 3. This could be explained in terms of "angle of repose".

Loose granular materials (representing sandy acidic soils) if poured into a heap, tend to settle at a much gentler slope than a more coherent material such as loam or clay i.e. sand has a lower angle of repose than loamy materials. So the former is eroded from steep slopes while loams cling to them. Using these concepts, the distribution of P. radiata sites in the Darling Ranges can be explained. There would be more plantations along the Helena Valley if the parent rocks were not so acid. The remaining phase (c) occurrences are low in nutrients and the remainder of the valley falls into phase (d) or the lateritic phases.

Water storage facilities limit development along the Serpentine, and downstream, phase (d) occurrences make management difficult as do fire protection problems. There are some sites worth considering, though short streams such as the Wungong and Dandalup system have relatively small drainage areas. Their valleys taper off so rapidly into (b) and (a) phases, that the distribution of P. radiata sites is limited.

The Murray, on the other hand, with its heavy volume of water, has cut a long, deep valley through the hills and gained many tributaries, in country with a high proportion of basic rock. The result is gradual phase transitions giving very extensive areas of the important (c) phase.

The Harvey and Brunswick phase (c) areas are rather limited and most available plantation sites have been earmarked. Some (c) phase remains on undeveloped private property on the Brunswick.

* "Acidic" and "basic" terms refer only to the predominant mineral types in the parent material, not to the "sourness" or "sweetness" of a soil.

The Collie River has a deep, steep-sided valley with only short tributaries within the area where desirable parent rocks occur. Hence the (d) phase occurrences dominate the scene. Phase (c) occurs in pockets well above the main valley floor, separated from it by phase (d) which makes management difficult.

The Blackwood from Nannup to Boyup Brook, also has a deep valley but it is wide. Also the country rock is mostly basic, producing a heavy textured fertile soil, capable of clinging to the many occurrences of 1 in 3 slopes. Further, with a wide drainage area, it has long broad tributaries like the Murray, and large areas of soil suitable for growing P. radiata. (Grimwade is on such a tributary). However, much of the land is under agriculture and must be repurchased for pine projects.

South of the Blackwood, there are considerable changes in climate, geology and soil patterns. The concepts considered above cannot be applied.

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