PINUS PINASTER IN THE HILLS

by A. L. Clifton

Within a 40 mile radius of Perth, we have practically run-out of P. radiata sites. Attention is now turning more to the planting of P. pinaster as a source of softwood in the hills country.

What sort of sites are available?

There are several. Firstly, it is well known that P. pinaster will grow on many sub-standard P. radiata sites in the river valleys of the hills. Secondly, based on experience on the coastal plain and at Gleneagle, pines will grow in a range of deep sands. Finally, with Gleneagle experience, it is found that P. pinaster grows well on the laterite silt areas. These are confined to drainage lines in the over 45" rainfall areas of the jarrah forest.

At present the minimumrainfall considered adequate for P. pinaster is 30" per year.

The problem of how to locate these sites is bound up in a knowledge of Land-forms; - the study of geomorphology. Much work has been done by officers of C.S.I.R.O. in the York-Quairading area and in other parts of Australia. The concepts used in this article lean heavily upon this work.

In 1952 C.S. Christian propounded a classification for country with a lateritic crust, giving it descriptive 3 categories.

They were

"Stable" *

"Erosional"

"Depositional"

These concepts fit very well into the northern jarrah forest zone.

The "stable surfaces" are where erosion has stripped all easily removed materials from the surface but is now hindered by a shield of massive ironstone which underlies most of the old soils of the area.

This "shield" is believed to have developed in the Miocene period, perhaps 3 million years ago. The old, undulating landscape of those times has been fossilised by ironstone and preserved with only slight modifications to the present day.

* In some official reports I have called this "Transitional" because it is between Depositional and Erosional.

This "surface" includes a number of minor land forms, which I don't intend to discuss technically; sufficient to say that the land is gently undulating, with broad, gently descending valleys, often containing bands of "laterite silt" *, one to five chains wide and associated with seepages and swamp vegetation. Gravel deposits and spillways are common too, with frequent massive laterite out-crop.

Jarrah dieback in the hills is almost exclusively confined to this land surface category.

Erosional Surface

As one goes down the drainage lines, the point is reached where the protecting laterite is worn thin, or even undercut by the erosion of running water. "Laterite silts" cease here; the slopes immediately next to the water course are steeper and there is a rapid improvement in soil fertility downstream. We have entered the Erosional Surface.

Let me digress slightly here to discuss the effect of Laterite.

The Ancient Laterite profile often extends for considerable depth, e.g. 100 ft. This profile has been impoverished by weathering;

its gravels are a poor-moisture-holding material;

its ironstone crusts are a barrier to penetration by roots;

its alumina layer is a sour zone, possible with toxic features (unproven); (This is the "mottled Zone" in the "Forest Soils" booklet diagram) and its pallid zone is a moisture-bearing zone with poor aeration. However, where the finer by-products of its breakdown accumulate, as laterite silt, sites hold some promise.

It is the stripping of the land surface, with truncation of the laterite profile, and exposure of country rock to soil forming processes that produces pine sites. This is well illustrated in the success of P. radiata on non-lateritic, red soils derived entirely from basic rock.

In between the extremes of undisturbed laterite and pure basic soils there are many phases of lateritic dissection, deposition of debris, recementation of debris, sorting of by-products, and so on. These effects are complicated by the varying ability of the underlying rock to release nutrients on decomposition, and by soil moisture ranging from being too wet to too dry. The term"erosional surface" thus embraces a complex continuum; some places will be good sites, others very poor.

Techniques are being evolved to define more precisely the productivity of these sites for P. pinaster.

Physiographic characteristics of this surface are steeper slopes, intensely tortuous contours, many drainage channels, well defined ridges, outcrops of country rock and erosional cusps. ** Erosion products are removed from the scene via drainage lines.

* C.S.I.R.O. men are now calling these "yellow earths", even though some are more red than yellow.

** These appear as scooped-out areas on aerial photos.

It is in this region of dissection that P. radiata sites are found (and plenty of sub-standard sites too).

Since the undercutting of the laterite crust is extending inland from the scarp edge, the major occurrences of this erosional surface are associated with the main drainage lines in the western part of the jarrah forest. Also, as these areas are nearest the metropolitan markets, and include existing plantations (Mundaring Division) they are receiving considerable attention with the view to extending P. pinaster plantations.

It is found that if the underlying fresh country rock is accessible to roots, heavier degrees of lateritic contamination are acceptable. Also lower standards of fertility can be effectively utilised. Moisture supplied in the limiting factor on sites consisting of shallow to hard clay, sheet rock, or massive secondary laterite.

Depositional Surface

Inland, stream beds are not so deeply incised, there is less rainfall and erosion products tend to accumulate in drainage lines, instead of being carried away. Consequently there are large deposits of sand in the 20 - 35" rainfall belt. These areas are referred to as the "Depositional Surface". Contributing to the quantity of erosion-products is the presence of a series of eroding granitic hills which rise above the general countryside (monadnocks). Eagle Hill, Mt's. Vincent, Cuthbert etc. are examples, though these do occur in a higher rainfall area than their smaller unnamed Mundaring counterparts.

The characteristics of this surface are a lack of well-defined watercourses; widely spaced, flowing contours; sand filled, flat valley floors; long gravel "Spillways" (Gently sloping deposits of gravel). Sand deposits of unknown origin also occur on interfluves * and gully-heads in this land-form category.

It will be readily seen that a large part of the Depositional Surface will be unacceptable as current thinking allows planting only to the 30" rainfall isohyet.

Summary

Increasing necessity to grow more P. pinaster has led to the investigation into extension of hills plantations with this species. Landform classifications in the hills areas is the key to site selection. This classification consists of "Stable", "Erosional", and "Depositional" Surfaces. Each is able to grow P. pinaster on distinctive, restricted sites.

Within the Stable Surface, only narrow belts of swampy "Laterite-silt" are available.

Within the Erosional Surface, sites similar to those required for P. radiata are to be used, but a lower standard of fertility and greater lateritic contamination are acceptable.

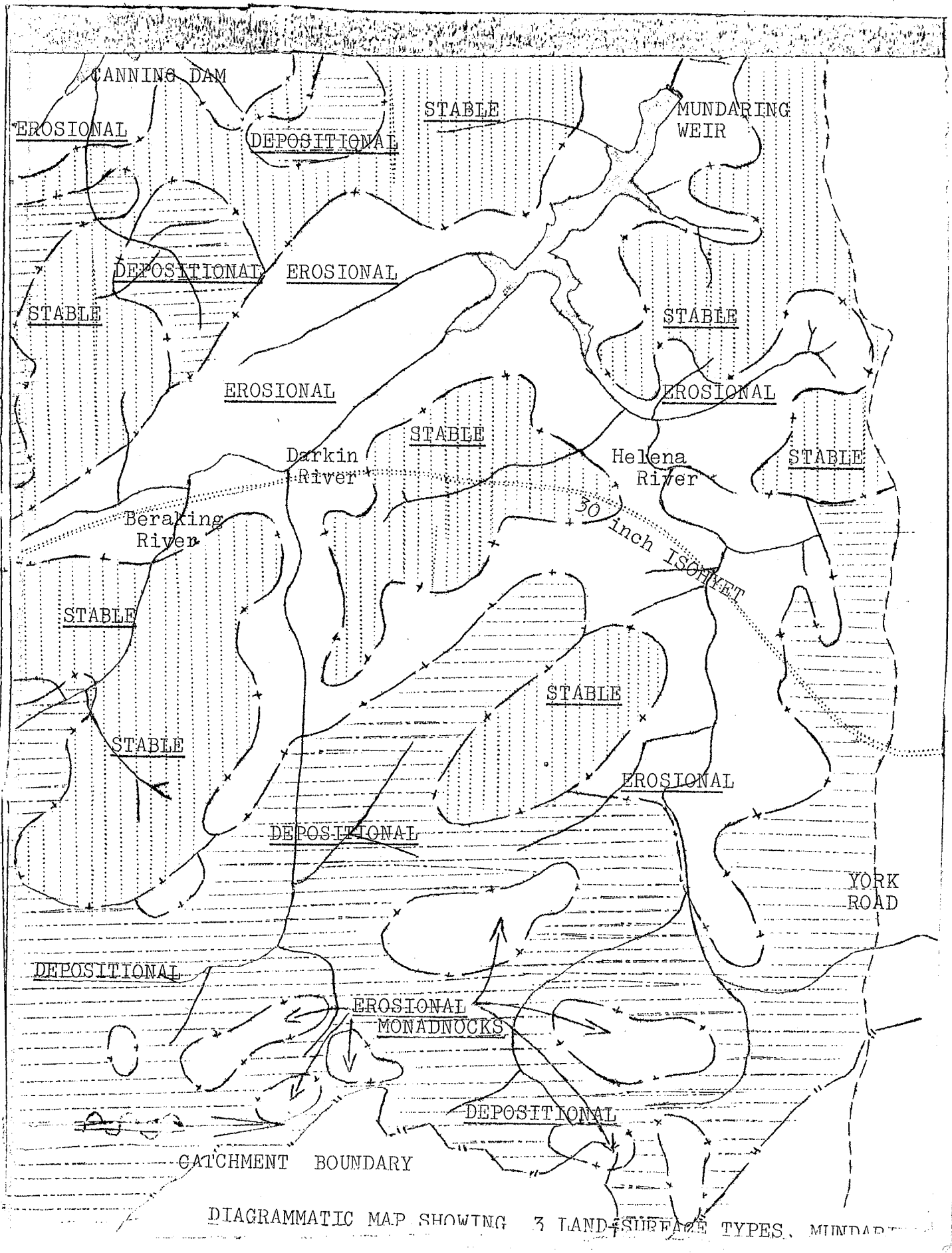
Further details on the requirements of P. radiata in relation to dissection of laterite are discussed in my dissertation.

References:

Clifton, A.L. - Soil surveying for P. radiata in W.A.

W.A. Forests Dept. Instruction Booklet. "Forest Soils". Chapter 7.

* Interfluve = boundary between watersheds.



DIAGRAMMATIC MAP SHOWING 3 LAND-SURFACE TYPES, MUNDAR