

An expedition to the source of the pine

Australia has more than 400 000 ha of radiata pine (*Pinus radiata*) plantations, and tens of thousands of hectares are planted each year. So, to an Australian, it can come as a surprise to learn that, in its native territory — coastal California and two small islands off the coast of Mexico — the species is restricted to five pockets totalling only about 6000 ha. The largest is near the city of Monterey — hence radiata's other name, Monterey pine.

The first known plantings of radiata pine in Australia were of a few seedlings brought from England in 1857. Today's plantations, our main source of softwood timber and pulpwood, probably derive from several small collections of seed brought from California towards the end of last century. The species was in demand then for shelterbelts and small woodlots. It had demonstrated an ability to grow very rapidly in a range of southern Australian climates and soils.

No records have been found showing just where the imported seeds came from, but it is possible that the source was only a small number of trees. And the seeds are unlikely to have come from the best trees in the best native stands. The stands with the tallest and straightest trees are in high country several kilometres inland from the Californian coast, and would have been much less attractive to last century's seed collectors than the storm-swept, low-branched coastal trees with abundant cones near Monterey.

The CSIRO Division of Forest Research believes that it may be possible to contribute significantly toward the aim of growing more wood on less land by selecting for different

parts of Australia the best progeny of seeds collected from a range of American stands. Hopefully, this would reduce the pressure to clear our native vegetation for pine plantations.

Also, widening the genetic base available for Australia's future plantations might reduce the damage done by any pine pest or disease that found its way to this country. This is because some strains of pine would probably prove more resistant than others.

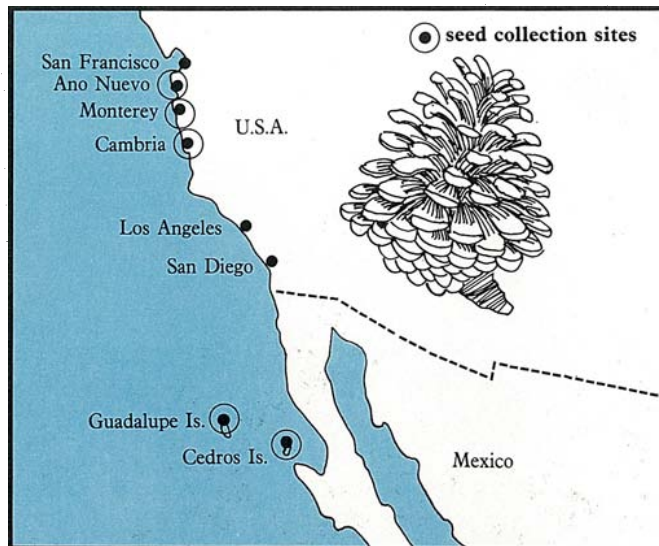
Early this year, under the United States-Australia Cooperative Science Program, Dr Ken Eldridge of the Division led a seed-collecting expedition to the three mainland sites where radiata pine grows as a native. New Zealand, Chile, Turkey, and several other countries are also interested in widening the genetic base of their radiata pine plantations, and the Food



and Agriculture Organization of the United Nations (FAO) supported the expedition financially.

The team included Mr Tony Firth, a tree breeder with the New Zealand Forest Research Institute, and Dr Cliff Ohmart, a CSIRO researcher stationed at the University of California, Berkeley, to study insect and fungal pests of the species in its home environment. Ms Karen Jerger and Mr Marshall Lyons, forestry graduates from Berkeley, were the other expedition members.

By climbing trees, and using a long pole with a strong metal hook on the end, the scientists collected cones from 515 trees



on the American mainland. Although the total area involved is quite small, the trees grow in environments ranging from windswept coast to moist inland valleys and dry hillsides.

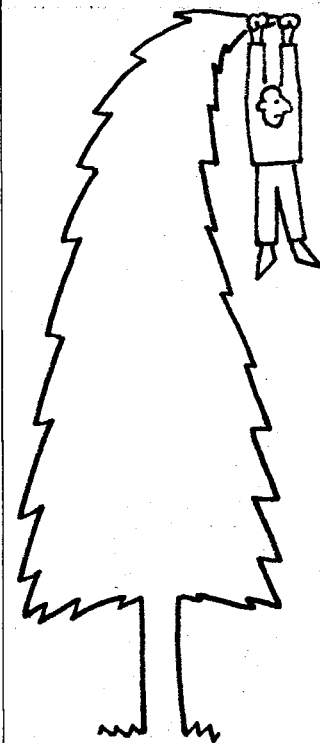
Three of the mainland team, and several American forest scientists, then joined an expedition led by Professor Bill Libby of Berkeley to collect from another 100 trees on the two islands, Guadalupe and Cedros. These islands are virtual deserts. The trees, confined to high ridges, obtain most of the moisture they need from heavy fogs swept up from the ocean.

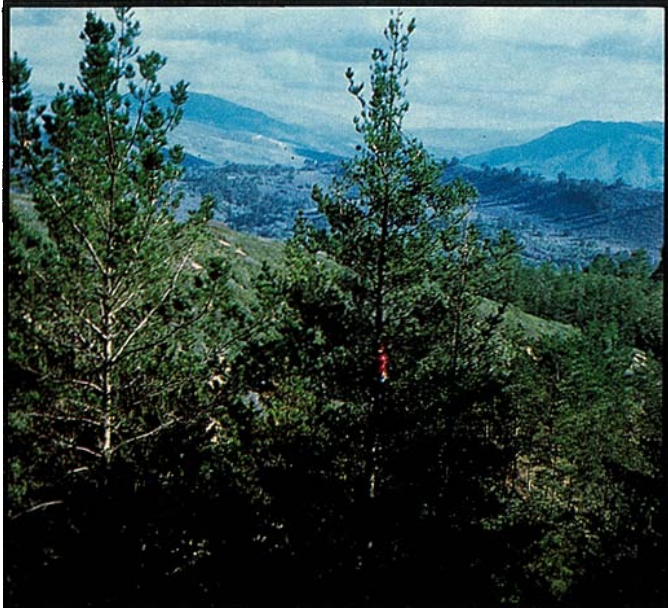
The scientists prepared detailed maps showing where all seeds came from. Staff of the U.S. Forest Service extracted the seeds from their cones. On arrival in Canberra, the seeds were subjected to strict quarantine measures — fumigation with methyl bromide and dipping in sodium hypochlorite. They were then available for distribution to Australian and overseas forestry organizations.

The main aim of the expedition was gene conservation — to ensure that the present genetic diversity of the native stands of radiata pine is not lost. In some areas, notably around Monterey, the trees are retreating rapidly in the face of urban development. On Guadalupe Island, only

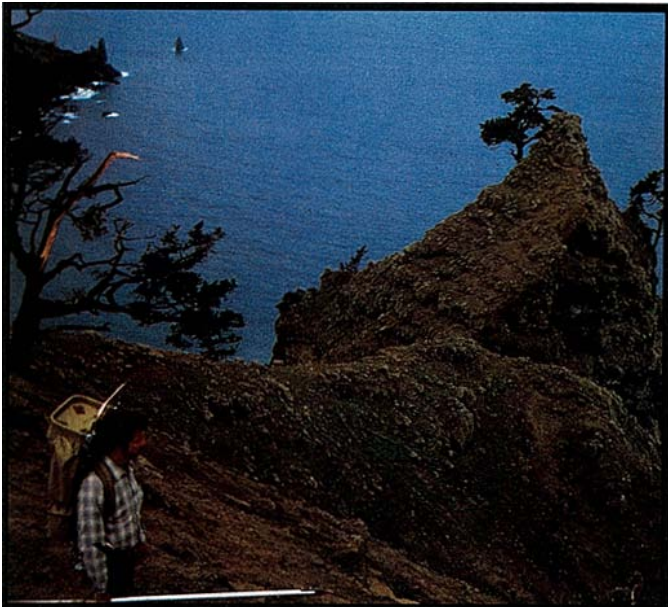
368 old trees remain. They are not being replaced by young ones because the island's numerous goats eat all the seedlings.

Back at the Division of Forest Research in Canberra, Dr Gavin Moran and Dr Colin Matheson are using an enzyme analysis technique on the seeds to find out how wide the genetic diversity in the natural population actually is. Seeds from Australian plantations are undergoing similar tests. Although they suspect that genetic variation in the natural populations might prove much





One of the team climbs for cones inland from Monterey.



Guadalupe Island, where radiata pines on high ridges obtain most of their moisture from ocean fogs.

greater than in our plantations, it will take some months to obtain results.

To conserve the genes of the diminishing natural populations, some seeds will be kept in cold storage and others will be planted. The planting will both ensure perpetuation of the genetic make-up of the collected seeds and show what sorts of trees they produce. Seeds from the new generation of trees will be available to tree breeders for improving plantation stock in Australia and other countries.

Some very damaging pests and diseases—notably bark beetles, the western gall rust

fungus, and a dwarf mistletoe—attack the Californian stands. This partly accounts for the fact that Australia's plantation trees, which are largely free of disease, generally grow faster, taller, and straighter. Other reasons are that our trees are generally grown on moister, more fertile sites, and at closer spacing.

Some of the native stands, however, are tall, straight, and evidently healthy. Whether their genetic constitution makes some radiata pines resistant to attack by particular pests and diseases remains to be determined.