In education, a policy of increasing awareness of authorities and public is necessary to ensure that proper resources are employed. In extension chemical industry has been active by schools; demonstrations, etc. in introducing herbicide technology. Extension work must continue on the principles of safe use of herbicides and their integration with other practices.

On the legislation side, while herbicides are approved for use by appropriate registration authorities, other weed situations created other than noxious weeds are not under legislative control with some notable exceptions (firebreaks on railways).

WEED CONTROL IN THE STATE FORESTS OF NEW SOUTH WALES

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In forestry there are four main situations in which weeds have a significant effect on the growth of trees or the management of forests. Since in each situation the control of these weeds requires a different approach, they are dealt with here separately.

PINE NURSERIES

Seedlings used in the establishment of plantations are raised in nurseries, the period between sowing and lifting for most species being approximately nine months. At the time of sowing the beds are weed free, but weeds are usually present before the pines have germinated. Subsequent growth of these weeds is such that they 'smother' the pines and compete for essential elements in the soil.

At the present time post-emergence weed control in nurseries in which *Pinus* spp. are being raised is carried out using mineral spirits having an aromatic content of approximately 20%, at 40 g.p.a. This method, while being generally satisfactory, has its limitations. To avoid damage to pines, application cannot be made until they have hardened up. This is usually about four weeks after emergence. During this time weed growth may have

reached a stage where the herbicide is not effective. In such cases the beds are hand weeded and mineral spirits then applied to newly emerged weeds.

Thus there is a need for the use of a pre-emergence herbicide which, when applied at the time of sowing, will control weeds for at least six weeks. Several such herbicides have been investigated in the past but, because at that time the nurseries were small, numerous, and situated on a number of different soil types, little progress was made.

Recently the trend has been towards the establishment of large central nurseries which allow the practice of crop rotation, and minimize the danger of damage to the pine crop due to build up of herbicide following repeated application.

In a pre-emergence trial carried out at Bathurst in 1967, chlorthal gave excellent control of annual grasses, particularly stink grass (*Eragrostis cilianensis*) without affecting the germination or subsequent growth of the pines. Some broad-leaf weeds, notably shepherds purse (*Capsella bursa-pastoris*), were resistant however, and for this reason more recent trials have been aimed at increasing the spectrum of weed species controlled by the application of chlorthal with other herbicides, such as propazine.

Evidence of the importance of weeds in competing for essential elements was obtained in the Bathurst trial. The table shows the quantities of essential elements taken up in the tops of weeds during an eight week period between successive hand weeding five months after the application of three rates, each of chlorthal and neburon.

PLANTATION ESTABLISHMENT

Areas on which conifer plantations are to be established generally carry forests of low quality native trees. These trees are felled and the resultant debris burned shortly before the pines are planted. This operation is usually followed by the appearance of woody weeds, including regrowth of Eucalyptus spp. from lignotubers or broken-off stumps, and seedlings of *Acacia* spp. from seeds stratified by the fire. Such weeds compete with the pines for essential nutrients, increase the fire hazard and if sufficiently dense may suppress the pines by over-topping.

Trials have shown that most of the weeds encountered can be controlled by the low volume application of 2 to 4% a.e. 2,4,5-T ester in water or dieselene. Formulations containing picloram plus 2,4-D or 2,4,5-T have also given satisfactory results when applied in water at 0.2 to 0.3% a.e. picloram.

The Influence of Pre-Emergence Herbicides on Uptake Of Essential Elements by Weeds

Treatment lb/ac. a.i.	Total uptake in top lb/ac.			
	P	Ca	Mg	K
C6	0.50	5.93	2.34	15.43
C12	0.17	2.07	0.81	5.37
C18	0.26	3.61	1.42	9.11
N2	0.59	2.61	1.09	9.11
N4	0.96	8.06	3.21	22.67
N6	0.45	4.80	1.90	12.77
Control	2.39	15.05	6.10	46.13
LSD (P=0.05)	0.59	6.78	2.66	17.33

Pinus elliottii has shown itself to be relatively tolerant to 2,4,5-T and this herbicide is used during the dormant season to control unwanted vegetation in areas planted to this species on the North Coast. Application is made by means of misting machines, the concentration being 2% a.e. 2,4,5-T emulsion in water.

On the other hand *P. radiata* has shown itself to be relatively susceptible to all of the above formulations, suffering damage to the leaders even during the dormant season. Trials are at present in progress in which the application of the potassium salt of picloram is being investigated, but should this formulation also cause damage to *P. radiata* then some consideration may have to be given to felling and burning one year earlier and spraying the resultant regrowth before planting.

At the present time then, the control of unwanted vegetation in *P. radiata* plantations is carried out manually. Since these plantations occupy the greater part of the acreage planted to conifers, this operations accounts for most of the annual cost of plantation cleaning. This cost was $208,784 in the year 1968/69, the area treated being 29,551 acres.

TIMBER STAND IMPROVEMENT

Timber stand improvement (T.S.I.) involves the elimination of unwanted trees in native forests. Such weed trees compete with desirable stems for nutrients and, especially in inland forests, for soil moisture. Examples are dense 'whipstick' stands of white cypress pine (*Callitris hugelii*) which are thinned by cutting off the cull trees below the bottom branches.

In addition to competing for nutrients and moisture, trees of poor form or species may over-top and thus interfere with the growth of desirable stems. Eucalyptus spp. constitute the majority of these weed trees and are treated by the application of 4% a.e. 2,4,5-T amine salt in water applied by means of knapsack sprayers to complete frills or cut stumps. Frills and stumps are usually cut as close to the ground as possible but with some of the more susceptible species frills are cut at a height approximately equal to the diameter at breast height. In the year 1968/69 T.S.I. operations were carried out on 29,559 acres of forest at a cost of $167,883.

A number of trials have been carried out on eucalypts using picloram formulations but while good results have at times been obtained they have been in the main variable. Because of the advantages that picloram appears to offer with respect to ease and cost of application, further trials are now in progress which are aimed at investigating the following variables:-

1. tree size,
2. dose rate,
3. season of application,
4. sapwood starch content (starch versus non-starch species),
5. available soil moisture.

ROADSIDE WEED CONTROL

Woody perennials growing along roads, especially those in coastal forests situated on the ranges, constitute a wide variety of species. In such situations they may create a fire

hazard or intrude onto the roads, thus reducing ease of access.

In general, treatment of these weeds is carried out by the high volume application of 0.4% a.e. 2,4,5-T ester in water. Because of the variation in density no attempt is made to apply the spray at a fixed rate per mile, but rather the speed of the vehicle is varied so that all vegetation can be thoroughly wetted. Although some species such as turpentine (*Syncarpia glomulifera*) and brush box (*Tristania conferta*) are relatively resistant, the method is faster and more economical than hand brushing, which in some areas has cost as much as $4 per chain. In contrast 660 miles of roadside were sprayed in 1968/69 at a cost of $13,887 or $21 for each mile sprayed on both sides of the road.

Lantana (*Lantana camara*) is treated in a separate operation using 0.2 to 0.4% a.e. 2,4-D amine salt in water as a high volume spray.

Apart from woody weeds, blady grass (*Imperata cylindrica* var. major) constitutes a fire hazard in some forests. Spraying with diquat at 2lb/acre a.i. followed by controlled burning has been found to be effective in removing this hazard but because of the high cost and the short term effects obtained, the use of this method is generally confined to small areas.