SELECTION AND PROPAGATION OF NEW ZEALAND NATIVE PLANTS FOR AUSTRALIA AND NEW ZEALAND

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Platt's Nursery is a native plant nursery growing the widest range of New Zealand native plants possible. This material is selected from the length and breadth of New Zealand and our many Offshore Islands. In accordance with our conservation policy, and because many of our plants are on the critically endangered list, we do not remove any plants from the wild for resale—only seeds and cuttings. We do take the odd plant for experimental or stock bed use. However, this is very rarely ever necessary. Many of the plants grown at Platt's were the first to be introduced into cultivation by any nursery.

We are now in a position to be able to sell all we can produce, including many plants that only a short while ago were either despised as weeds or never considered as suitable plant material for amenity horticulture. The public seek us out from all over the country, and increasingly from overseas. We do not advertise, but do carry out some direct promotion by giving talks to local gardening circles, conservation groups, and service clubs; also, stands at local trade shows and fairs have been very successful. Unfortunately, we are not able to be involved in mail order, as this is uneconomic, and we often have to leave many letters unanswered from all over the world from people wanting particular plants or information.

After visiting a large number of nurseries throughout New Zealand and a few in Australia, I am heartened by the increasing number of New Zealand plants being produced. However, my enthusiasm for quantity is not matched with that of quality. A recent survey I carried out in Auckland's garden centres confirmed that not less than 50% of all New Zealand native plants sold were variegated freaks, mutant deviations and, in some cases, virus-infested runts. One major retail outlet had 80% mutant deviations, and only 20% species. I was rather amused to be told by this group's purchasing manager that the sale of native plants was declining—a situation that did not surprise me, considering the quality of stock offered. I am delighted the gardening public, farmers, and city parks personnel are starting to reject these poor quality deviations, which have become the norm in native plant sales.

Many gardeners and native plant enthusiasts have persistently made the claim that New Zealand plants are somehow different and harder to grow than many of the exotic plants with which they have had experience. This is a contention I have always disputed. How could a New Zealand plant be any different from any other nation's?

However, I have now isolated four answers to this question and must concede, in some cases, they are correct.

1. Those exotic plants grown in New Zealand were already successful in their country of origin whereas those unsuccessful species were never introduced into cultivation.
2. Most unsuccessful New Zealand plants are rain-forest plants, or have other very specific climatic or physiological limitations.
3. Those native plants that are successful are, for the most part, not rain-forest plants.
4. Species that have been consistently unsuccessful have not been selected from suitable genetic stock.

RAIN FOREST PLANTS

It was our interest in kauri trees (*Agathis australis*) that finally opened my eyes to the essential requirements of rain-forest plants. How is it possible for these magnificent giants of a thousand years or more to grow so well, and only 50 yards away in a domestic garden to do so pitifully. Everything is the same—or is it? The answer is very simple. Rain-forest plants do not grow in soil. Rain-forest plants are dependent on the organic litter that builds up on the forest floor from the falling leaves, bark, twigs, branches, dead fallen trees, and decomposing animal life; such as worms, bugs, insects, birds, etc. This organic litter is important for root development and nutrient uptake, and in many cases the habitat of essential mycorrhizal fungi. These symbiotic fungi are the essential step in translocating nutrients from the organic litter into the plant roots.

As a result of these observations, we now recommend that growers of native plants never plant them in soil, but on the top of cultivated soil covered with a bed of organic mulch to the depth of the nursery container (Figure 1). The results of this procedure are dramatic. A number of species are now growing up to ten times faster than what we accepted as normal. Where we once expected 6 in. growth per annum, we can now get 36 in. or more. These specifically include all our native soft-wood conifers and podocarps, and the broad-leafed terminal trees. Further study of the natural order of vegetative progression of a rain-forest was essential to understand the specific requirements of these plants, and has been most enlightening, explaining the different cultural needs of New Zealand plants.

We have been able to isolate six separate stages in the development of a natural rain-forest (Table 1, Figure 2). It is important, however, to remember that at times some stages can be completely bypassed—also, the introduction of foreign weed and animal species has further complicated natural forest development.

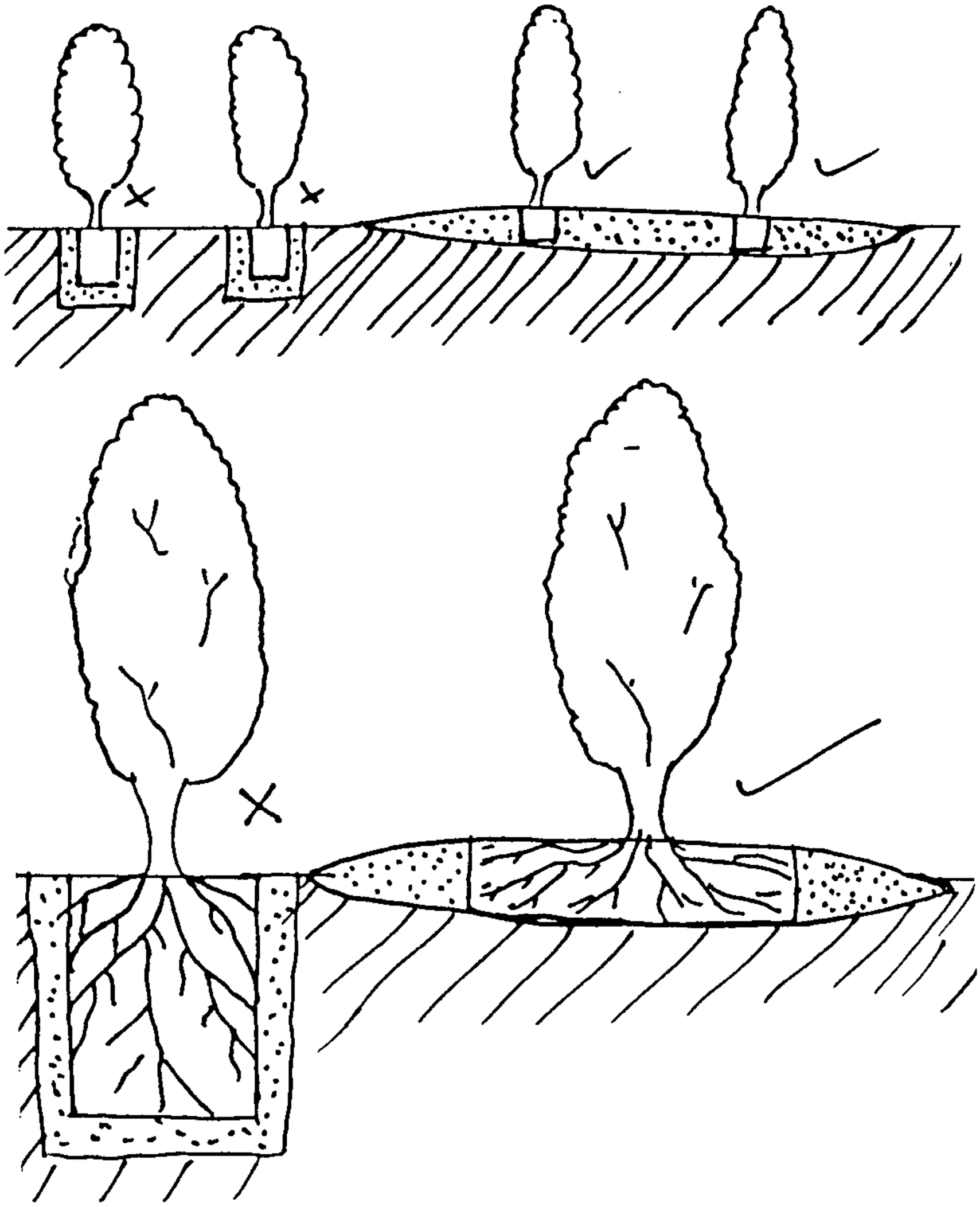

Figure 1. Recommended procedure for planting and growing New Zealand rainforest plants.

Above. Small trees. *Left.* Incorrect. *Right.* Correct.

Below. Large trees. *Left.* Incorrect. *Right.* Correct.

Large trees are best grown in flat containers and should not be planted in holes but in a cultivated bed of humus on the surface of the ground.

Table 1. Natural Order of Vegetative Progression of New Zealand Rain-forest (Based on seed germination and species establishment dictated by favourable conditions created by the preceding stage.)

STAGES					
1. Vegetation free	2. Primary herbaceous colonization	3. Secondary growth	4. Primary broad-leaved forest	5. Mature softwood rain-forest	6. Terminal hardwood decadence
		Some Typical Species			
	Under 3 ft.	3 to 20 ft.	30 ft.	80 to 200 ft.	50 to 100 ft.
	Carex *Celmisia* *Chionochloa* *Cotula* *Epilobium* *Festuca* *Pimelia* *Raoulia* *Scleranthus*	*Brachyglottis* *Coprosma* *Cordyline* *Coriaria* *Corokia* *Cortaderia* *Gahnia* *Hebe* *Kunzea* *Lepto-spermum* **Metrosideros* **Nothofagus* *Phormium* *Pomaderris* *Sophora*	*Aristotelia* *Brachyglottis* *Coprosma* *Cyathea* *Dicksonia* *Griselinia* *Hoheria* *Knightia* *Melicytus* *Myrsine* *Olearia* *Pittosporum* *Pseudopanax* *Sophora*	*Agathis* *Dacrycarpus* *Dacrydium* *Libocedrus* *Podocarpus* *Prumnopitys*	*Alectryon* *Beilschmiedia* *Corynocarpus* *Dysoxylum* *Elaeocarpus* *Hedycarya* *Litsea* *Nestegis* *Rhopalostylis* *Vitex*
		Usual Depth of Organic Litter			
Nil	0 to 4 in.	0 to 12 in.	8 to 12 in.	½ to 6 ft.	1 ft. to 6 ft.
		Light			
	Intolerant of shade	Intolerant of shade	Semi-tolerant of shade	Juvenile tolerant of light shade	Juvenile very intolerant to light
		Wind			
	Very wind tolerant	Wind tolerant	Reasonably wind tolerant	Intolerant of wind	Intolerant of wind

*Form forests in their own right

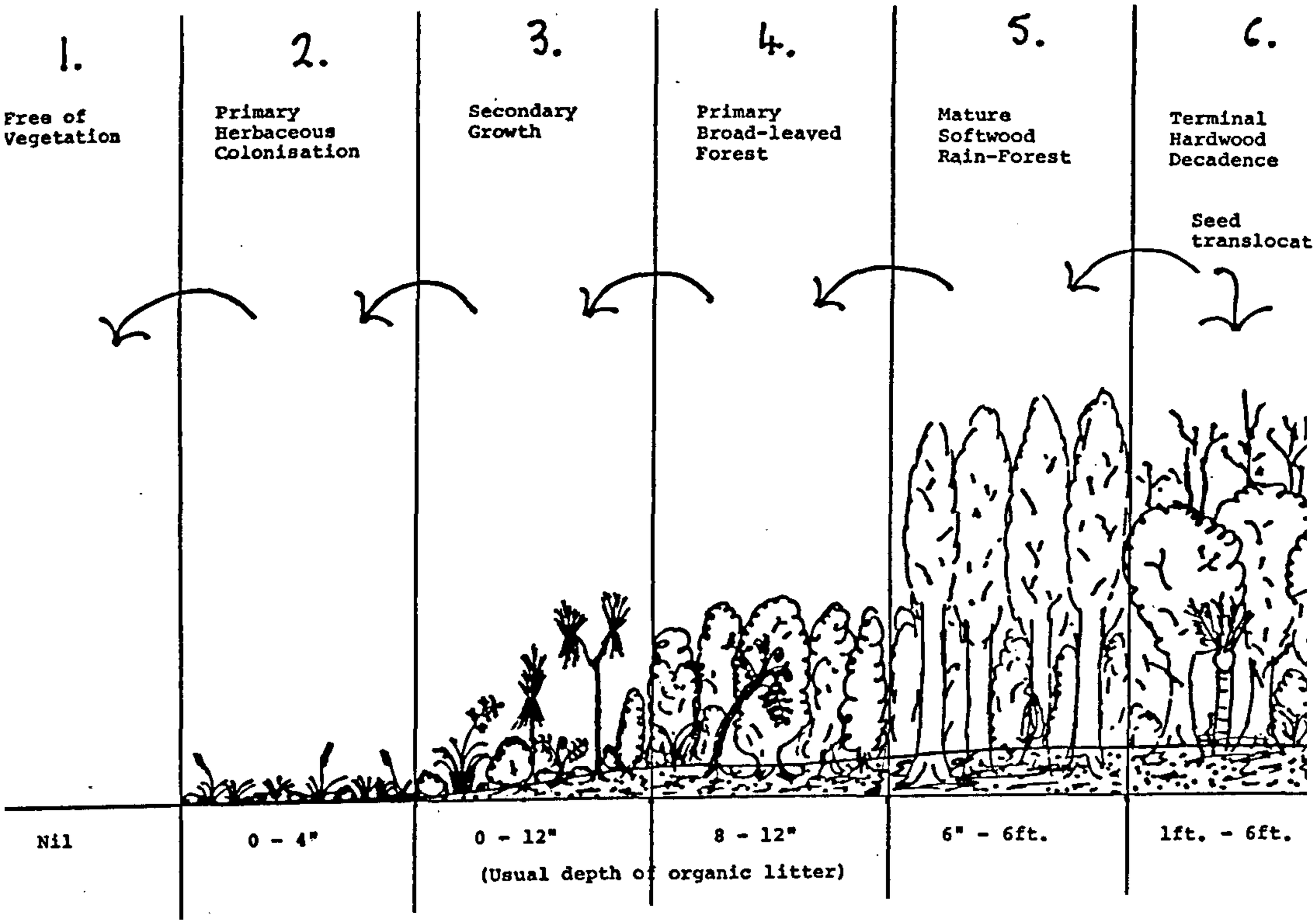

Figure 2. Natural order of vegetative progression of New Zealand rain-forest plants.

Stage 1. (Vegetation free). Stage 1 is devoid of any natural vegetation. New Zealand does not have any real deserts. However, small areas are devoid of vegetation, such as mobile coastal sand-dunes; glacial moraine; areas of high natural mineral toxicity; impervious rock; and the high altitude nival zone. The major causes of natural vegetative destruction and clearance are fires, land slips as well as avalanches, wind storms and volcanic ash showers. These areas may be very rapidly re-colonized.

Stage 2. (Primary herbaceous colonization). These first colonizers are plants that flourish in sand, gravel, shattered rock, and poor clays including all manner of mosses, lichens, small creeping herbs, mat plants, and small grasses. These plants are basically herbaceous. The general trend is that they are plants with seeds which are wind-distributed, and these seeds keep fairly well. Seed germination is enhanced with light. These species are intolerant of shade.

Stage 3. (Secondary growth). Plants of this Stage overtake Stage 2, and will flourish in a wide range of soil types and conditions. Insects and birds play a part in the pollination of this group. Seeds generally keep reasonably well. Light is required for seed germination of many of these species. Plants, for the most part, are intolerant of shady conditions.

Stage 4. (Primary broad-leaved forest). Stage 4 again supersedes the other two growth stages, and this vegetation is made up of a very diverse selection of large shrubs and small hard-wood trees, which are very tolerant to a wide range of growing conditions; such as wind, poor soil, frosts, etc. The bulk of our most successful New Zealand plants in cultivation come from this stage. These plants are easy to grow under a wide range of conditions, and respond well to organic mulching, but it is not absolutely essential. This stage is the cover for the establishment of plants of the next stage.

Stage 5. (Mature soft-wood rain-forest). It is the Stage 5 plants which have consistently caused the most problems in cultivation. Seed from this stage have established themselves earlier under the cover of Stage 4, and the most important consideration here for the nurseryman is that these seed germinate in the humus litter now being built up. Therefore, in cultivation these plants require humus and shelter from wind to establish well. Light shade is only required in the juvenile growth phase. These soft-woods include all of our giant trees—*Agathis, Dacrydium, Libocedrus,* and the podocarps. Seed as a rule keeps badly and must be sown fresh. Soil pH drops with the build-up of humus from the creation of humic acid, and the resultant podzolisation destroys the forest. None of these trees can tolerate their root zone drying out.

Stage 6. (Terminal hard-wood decadence). Stage 6 is the final and terminally decadent stage of the rain-forest. Stage 5 plants cannot re-establish themselves under themselves, because their seed do not germinate in dense shade. Therefore, Stage 6 plants take over. These are our broad-leaved hardwoods, and some are the most troublesome for the cultivator. These seeds are often large, such as in *Corynocarpus laevigatus, Beilschmiedia tawa,* and taraire. These crash to the forest floor or are spread by birds, whereupon they germinate in dense shade in association with organic litter that can be up to 6 feet deep. Many of these Stage 6 trees are much admired but do very poorly in cultivation—always because their basic requirements are not understood.

After Stage 6 you return to Stage 1—i.e., terminal decadence can be replaced by destruction, and the process starts all over again.

Having established that plants are not created equal, and have a very specific place in the natural order of progression, there is a factor which completely contradicts this natural order.

GENETIC DIVERSITY

Inherent in every species is a broad genetic diversity, thereby allowing the species to adapt to its ever-changing circumstance. This genetic diversity is passed on in the plant's seed. We have been absolutely astonished at how wide this diversity can be. Because most New Zealanders live in an area with a reasonable climate, they, for the most part, do not realize just how severe our climate can be in the remote areas where few people live, and where many of our most interesting plants still survive. This isolation is also the reason why the natural habitat of these plants has not been destroyed.

RAINFALL

The rainfall in Fiordland can, in some areas, be between 200 and 300 inches per year, and 36 inches in 24 hours is often quoted as being heavy rain at places along the Milford Track. Mt. Egmont has recorded 70 in. in one month, and many areas record a 1 in. per hour for 24 hours. Large areas of New Zealand mountains receive over 100 in. per year. Is it any wonder that plant material taken from these areas fail in suburban gardens, which in the summer may receive as little rain as 1 in. in 3 months, and a total for the year of only 35 in.?

Some of our mountain valleys are full of glacial ice, and have been that way since before the last Ice Age. These valleys may receive a frost most nights of the year. Many of you will have seen the beautiful mountain river valleys that are free of trees on the river flats and the level ground. That is because the frosts are so severe the trees cannot grow. However, the relatively warmer mountainsides will be covered with trees until you reach the treeline higher up. Plants taken from these cold areas do not flourish in a warm, sub-tropical city that receives, maybe, one or two mild morning frosts per year. Other areas receive very low rainfall—below 10 in. for Central Otago.

This very diverse climate—with its winds, its frosts, and its rain—and the extreme geological diversity of New Zealand, have further enhanced the genetic diversity of our plant species. By selecting seeds from the correct site, many species that I had considered impossible to grow are now flourishing in our climate. Nature has already done the selection for us. All the propagator has to do, if he wishes to grow a species, is to visit an area with the correct climatic factors and select seed. Of the countless billions of seed that are produced every year, only that which is fit for the specific site will grow, and therein lies the answer to the selection of suitable plant material.

Leaf shape and size are the most obvious examples of genetic diversity. Larger flowers and different flowering times are also conspicuous. The larger-leafed variants come from the warmer sites.

Our Offshore Islands have very large leaves compared with colder mainland locations. However, it is the invisible differences which are the most interesting—plants that are tolerant to insects; plants that are more tolerant to wind, to pathogenic fungi, to higher light, to alkaline or acid conditions, to heavy frosts, to wetter ground, or to the browsing of noxious animals. (New Zealand had no browsing animals, but it is interesting to note that the Australian bushy-tailed possum is wiping out some plants, but there are members of the same species that they leave untouched. These untouched ones must be unpalatable to them.)

With *Pseudopanax discolor*—a natural shade, under-storey plant, that we were never able to get to grow in cultivation while we were selecting material from its natural habitat—we finally selected material growing on a hot, sunny, rocky hillside, and we found that plants taken from this source are now flourishing in cultivation. These plants were only 100 yards from the forest shade-loving types.

Metrosideros parkinsonii is a shrubby small tree that grows at an altitude over 2,000 feet in cool, misty, rainy mountaintops. Our first efforts to grow this plant were a total failure, until we again selected seed from the driest, rockiest site, which was not typical of its natural habitat, and we now have it thriving in the nursery. Seed taken from this nursery plant now grow so well that I often wonder why I had such despair in trying to cultivate this plant.

Each species has its inherent diversity, so by collecting the correct seed type for the conditions where the plants are to be located will ensure good results. This selection of the correct plant material for your site can be further assisted by collecting very large amounts of seed then, after planting, subject them to a rigorous selection process. Use no fungicides or insecticides; and let the sun, the wind, and the rain do their worst. This will kill off all unsatisfactory material. The survivors are able to flourish under those conditions, so these survivors are the plants you want. We have established that many of these hitherto impossible plants can be made to flourish by this simple procedure.

SUMMARY

To summarize, in the past many New Zealand native plants have done poorly in cultivation, because of poor genetic-type and the planting of rain-forest plants in soil

1. New Zealand native plants should not be planted in soil, but in rich beds of organic humus.
2. Inherent in every species is a genetic diversity which allows us the opportunity to select a form of the species that will perform up to expectations in most conditions.