

“Liner Propagation and Production” Question-Answer Period

PETER CATT: Can you help with the problem we've seen with the strength of the fertilizer solution on newly rooted magnolia cuttings?

SANDY HOWKINS: We leave the rooted cutting in the plug until it has started vegetative growth. One of the reasons we feed it is so the root system does get used to a salt-based fertilizer. When you transplant the cutting still in the peat plug into a container medium containing 10 lb of fertilizer per yard, the plant is protected somewhat by that peat plug.

LAINE MCLAUGHLIN: Do the peat pots come with holes poked into them?

SANDY HOWKINS: Yes.

ANONYMOUS: Can you use the same procedures for evergreen magnolias?

SANDY HOWKINS: Yes, you can. The only difference is that we do cut the leaves and we only take off the top $\frac{1}{3}$ and the cutting has 5 or 6 nodes.

Seedling Propagation of Four New Zealand Podocarpus Species

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BACKGROUND

New Zealand (N.Z.) forests have suffered a systematic destruction of the forest cover from the time of settlement 4000 years ago that was only accelerated by colonization 150 years ago.

This destruction, particularly of coastal and lowland forests on more accessible sites was principally for timber and clearing for agricultural production. This has ceased in recent years with a ban on all indigenous logging except from certified sustainably managed forests. Fortunately, extensive areas have been set aside in national parks, national forests, and reserves. Of the 6 million ha, 1 million ha remaining is privately owned. However, the publicly protected lands are not fully representative of the whole range of N.Z. landscapes, natural areas, and ecosystems. Some of the under-represented areas are the estuaries, freshwater wetlands, scrublands, tussock grasslands, and lowland forests.

In recent years, conservation has become of much wider interest to the public in general and many groups have been pressing the case for protection of natural features in the landscape. The Queen Elizabeth the Second Traditional Trust has a significant and essential role in assisting to redress the current imbalance in the range of natural areas protected in N.Z. One challenge when seeking to protect natural features and landscapes can be working with private landowners and involving them directly in the protection and restoration of areas. The Trust

empowering Act gives it the responsibility for encouraging and promoting the provision, protection, and enhancement of open space for the benefit and enjoyment of the people of New Zealand — a broad and daunting canvas, for it encompasses any important landscape feature of aesthetic, cultural, recreational, scenic, scientific, or social value. This involves protecting natural features of the landscape on privately owned land, including Maori land, by means of open space covenants; by purchase or through gifts and bequests promoting awareness of landscape values; and promoting and coordinating landscape protection.

Since 1977 just over 780 open space covenants have been registered nationwide, involving some 27,200 ha; a further 450 covenants involving 42,700 ha are in the pipeline and proceeding towards registration.

A very good example of the exploitation of our indigenous forest resource is the N.Z. kauri — *Agathis australis*; kauri, is the most famous of N.Z. native trees and one of the largest trees found anywhere in the world. Tane Mahuta in the Waipoua Forest is 51.2 m tall with a girth of 17.2 m and has been calculated to be over 2000 years old. The largest recorded kauri on record was 21.8 m to the first branch and 23.43 m in girth. Of the estimated 1.2 million ha of original forest only about 142 ha remain.

PODOCARPUS

Podocarpus is an extensive genus with 72 species distributed throughout N.Z., Australia, Malaysia, India, Japan, East Africa, and Central and Southern Africa of which four species of forest trees are endemic to N.Z.

***Podocarpus totara* - totara.** The totara is a tall massive trunked forest tree. In its early stages it is a spreading bushy tree, but as it gains height it acquires a massive trunk and dense foliage. A totara tree may live to a great age of up to 800 years and the Maori people prized its durable timber to manufacture war canoes and ceremonial carvings on meeting houses. All totaras are dioecious with pollen shed in November and December. The seed grows quickly after pollination and a red fruit receptacle attracts birds which feed off the fruits and spread the seed.

***Dacrycarpus dacrydiodes* - kahikatea/white pine.** The kahikatea is our tallest native tree with mature specimens recorded at 60 m. It is found throughout N.Z. in forests up to 600 m in altitude where it is often the dominant tree species in swampy areas. The kahikatea seedling changes through juvenile, semi-adult, and adult foliage stages. The male cones and female ovules are borne at the tips of branchlets on separate trees. The female tree glows a faint red when its berry-like receptacles are ripe.

***Prumnopitys taxifolia*.** *Prumnopitys taxifolia* is a round-headed robust tree to 25 m. The young shoots are lush and colorful in the spring and its exfoliating bark which flakes off in thick rounded chunks leaves reddish blotches on the trunk. The wood is a deep red, very hard with a handsome close grain. The seed once pollinated takes 12 to 18 months to mature. About 10 mm in size, the seed is a deep blue-black color, its stalk never swells to form a fleshy receptacle as in most other N.Z. podocarps.

***Prumnopitys ferruginea* - miro/brown pine.** Miro forms a tall round-headed forest tree to 25 m. Miro is a slow-growing tree, preferring shady situations. Seed crops do not occur every year. Purple when ripe, the seed takes 12 months to mature.

The fruits of the miro are the favorite food of the native wood pigeon. They will come long distances to gorge themselves on the ripe drupes which smell strongly of turpentine. Hence, the pigeon play an important role in spreading the seed throughout the forest.

SEED COLLECTION AND STRATIFICATION

The four species give two quite distinct stratification and seed-handling procedures.

Totara and Kalkatea. The seed must be collected fresh and handled promptly. Twenty percent shade cloth makes ideal screens to lay under the seed trees once seed fall has begun. Seed should be collected every second day and once cleaned of twigs and trash, stored in a air-tight container in a cool store, but sown as quickly as possible. It is important that seed moisture is not lost as this will result in rapid loss of seed viability.

Matai and Miro. The seed will drop from the trees in late autumn or can be collected from the trees if the birds are removing it all. Matai requires a minimum of 12-month cool moist stratification in moist sawdust or peat and is subsequently sown in the autumn. Miro requires a longer stratification under the same conditions as matai and should be sown after a 24-month cool moist period.

SEED SOWING

Appletons' Tree Nursery practices a fixed seedbed production system with the majority of seed sowing occurring in the autumn. The seedbed is thoroughly ripped using a Howard paraplow and 10 cm of composted pine bark is added to the growing area. The raised bed is formed by a rotohoe with a modified bed-forming attachment. Raised seed beds of 15 cm in height aid drainage and encourage earlier germination and more accurate undercutting.

The four species respond well to higher levels of soil nutrition. This is achieved by a combination of coated, slow-release fertilizer, side dressing of balanced NPK granular fertilizer, and foliar feed. Seed is broadcast by hand at an ideal seedling density of 200 plants per meter.

Previous crop records and a cut test are used as a guide to seed density at sowing. The seed is covered with sawdust and an arch of 40% shade cloth or manuka brushwood for shade and wind protection.

Seed is subjected to a 5-month winter-frost period which helps overcome the chilling requirement prior to germination. Germination occurs in September and careful attention must be paid to pest and disease control. The shade is removed once the plants are 10 cm tall, choosing a cloudy day, so as to allow hardening off.

A reciprocating undercutter is used to cut the tap root of the plant to produce a compact fibrous root system. It is vital that the plant is not stressed, breaking the active growth cycle. Soil moisture at or near field capacity reduces soil movement and plant stress. Irrigation is advisable during periods of desiccating winds. Using good cultural growing practices it is possible to achieve seedlings averaging 35 to 45 cm in height in two growth seasons.

By producing well grown robust open-ground seedlings, Appletons' Tree Nursery offers tree planters an economical tree stock option for restock of existing and planting of new areas.

MANAGEMENT OF FOREST REMNANTS

The three options for managing forest remnants are natural regeneration, regeneration using nurse trees and revegetation.

Natural Regeneration. Where livestock and fire are excluded, natural regeneration may be sufficient to ensure the survival of the forest remnant. The regeneration will occur through the growth of seedlings from seed trees and birds carrying seeds from nearby areas.

Regeneration Using Nurse Trees. Nurse plants can be utilized for accelerating the natural process of regeneration by creating a favorable microclimate for the germination and growth of native seedlings. This approach is most useful on exposed sites where the nurse plants provide shade and shelter.

Revegetation. Revegetation or restoration can be described as new or supplementary planting to accelerate the natural process of regeneration. This is often the best approach in managing small forest remnants where the bush has become open to sunlight and exposed to the wind because of milling, grazing, or windthrow. In these situations the natural process of regeneration may take a very long time even if browsing animals are excluded because the site will be invaded by grasses and other weeds such as old man's beard. Revegetation using fast-growing trees that occur naturally in lowland forest communities will suppress the grasses and other weeds by excluding light and allow the process of succession to proceed. Revegetation may also make it possible to form a more complete plant community by including plants from nearby stands that no longer occur in the remnant being replanted.

THE SEQUENTIAL ORDER OF NEW ZEALAND FOREST DEVELOPMENT

The New Zealand bush (forest) passes through six clearly defined stages before becoming climax broad-leaved forests.

Stage 1 - No Vegetation. As to be seen after a bushfire, volcanic eruption or major sandblow, and is represented by no plant growth.

Stage 2 - Primary Herbaceous Colonization. These are the first plants to appear and are dominated by grass and broad-leaved herbs. *Carex*, *Poa*, *Danthonia*, and *Celmisia* are to be seen at this stage.

Stage 3 - Woody Colonizers. Woody colonizers may be both shrubland plants and forest trees. The shrubland plants are dominated by *Leptospermum*, *Kunzea*, *Cassinia*, *Weimmania*, and *Sophora*. Stage 3 is also dominated with exotics such as gorse, *Pinus*, and *Eucalyptus*.

Stage 4 - Primary Broad-leaved Forest. This stage of development is the home of *Pittosporum*, *Myrsine*, *Melicytus*, *Pseudopanax*, *Knightia*, *Coprosma*, *Griselinia*, *Hoheria*, and tree ferns (both *Cyathea* and *Dicksonia*)

Stage 5 - Softwood Forest. The softwood trees are the giants of the forest - *Agathis*, *Podocarpus*, *Prumnopitys*, *Dacrocarpus*, and *Dacrydium*.

Stage 6 - Climax Broad-leaved Forest. *Vitex*, *Dysoxylum*, *Corynocarpus*, *Beilschmiedia*, *Syzygium*, and *Phopalostylis* dominate Stage 6.

The sequential order of progression does not change in any part of the country or

in any ecological habitat—only the genera makeup alters. Each genus will be represented from the correct sequential stage.

All stages will become climax in sites of adversity. For example, Stage 1—primary herbaceous colonization will remain as grassland in perpetuity when it is so severe that the woody colonizers can't take over. Stage 2—woody colonizers will remain shrubland in perpetuity in sites that are so severe that they cannot be taken over by primary broad-leaved forest, etc. The natural forest is a place where all plants are trapped in sites of adversity, except the climax broad-leaved genera. These occupy the sites of luxuriantion, marginalizing all other plants to the limit of their survivability.

It takes about 1000 years for a forest to reach Stage 6—climax broad-leaved forest in a site of luxuriantion.

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