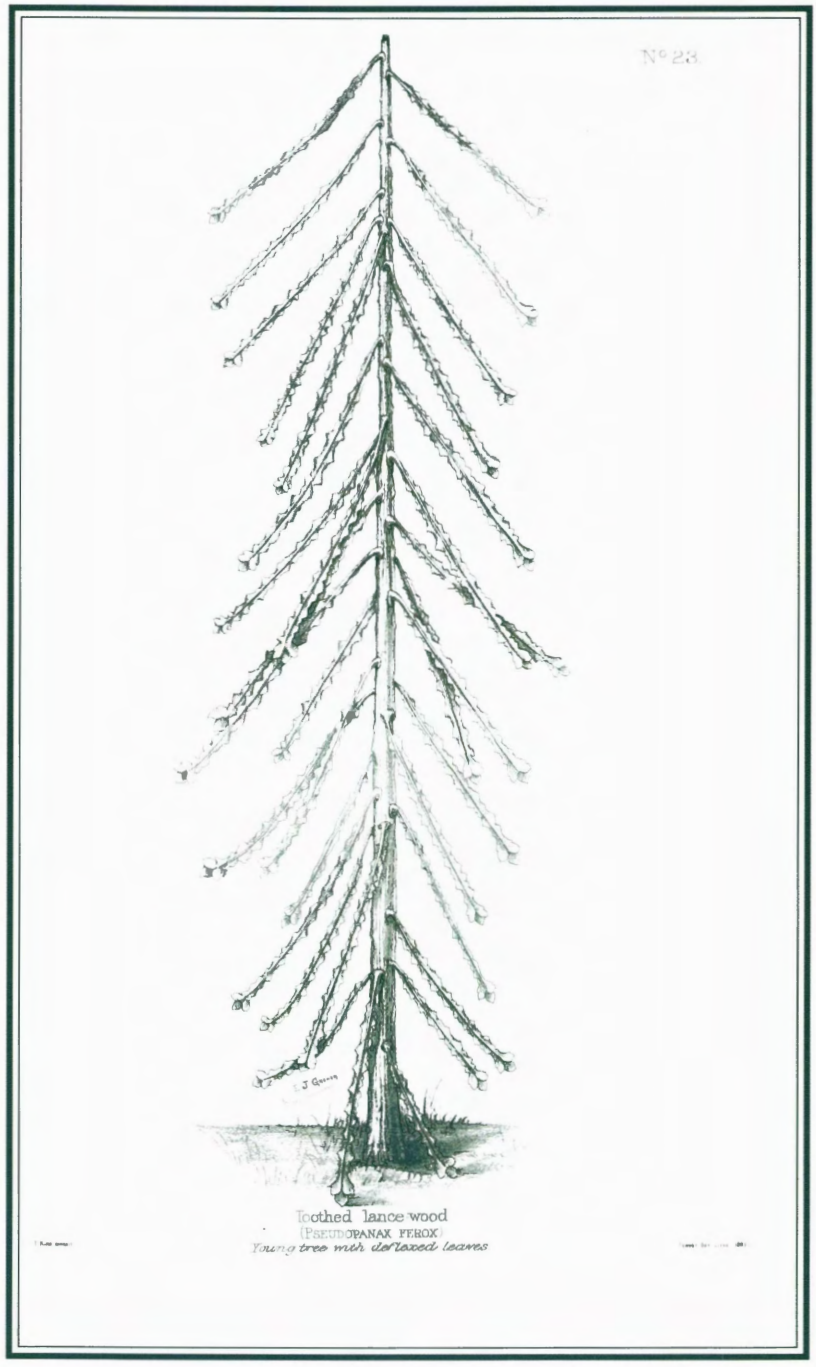
NEW ZEALAND GARDEN JOURNAL



Journal of the Royal New Zealand Institute of Horticulture(Inc)
Volume three, Number two, December 2000

Volume three, Number two
December 2000

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Contents

Cover illustration: Toothed lancewood, (*Pseudopanax ferox*), young tree with deflexed leaves. No.28. *The Forest Flora of New Zealand, T. Kirk, 1889.*

The New Zealand Garden Journal reborn

Members will have noticed copies of the Garden Journal once again appearing as part of their RNZIH subscription. The Journal, discontinued in 1997 because of its cost has been relaunched albeit it in a slightly different form.

Firstly it will be published twice a year in June and December instead of quarterly. It will, however, contain the same mix of scholarly articles on horticulture, botany and the related sciences with an emphasis on New Zealand plants and gardens. Future articles include the use of biosolids in horticulture, New Zealand's Californian garden legacy, weeds and horticulture, and Pukekura Park Fernery.

We would appreciate some feedback on the sort of articles you would like. We are not going to ask you to prepare articles, although we are always grateful for offers!! However, if there are topics you think we should cover let us know and we will search out suitable authors to write them. One hot topic at the moment is biotechnology and we will be looking for someone to update us on that next year.

Apologies for the delay with the first issue. This has meant two issues have come out in quick succession. We take full responsibility for the delay in the first issue, caused partly by human error and partly by technology.

Happy reading

Mike Oates, Editor, New Zealand Garden Journal

Plant Materials Utilised in Constructing Pre- European Maori Houses

Mike Burtenshaw
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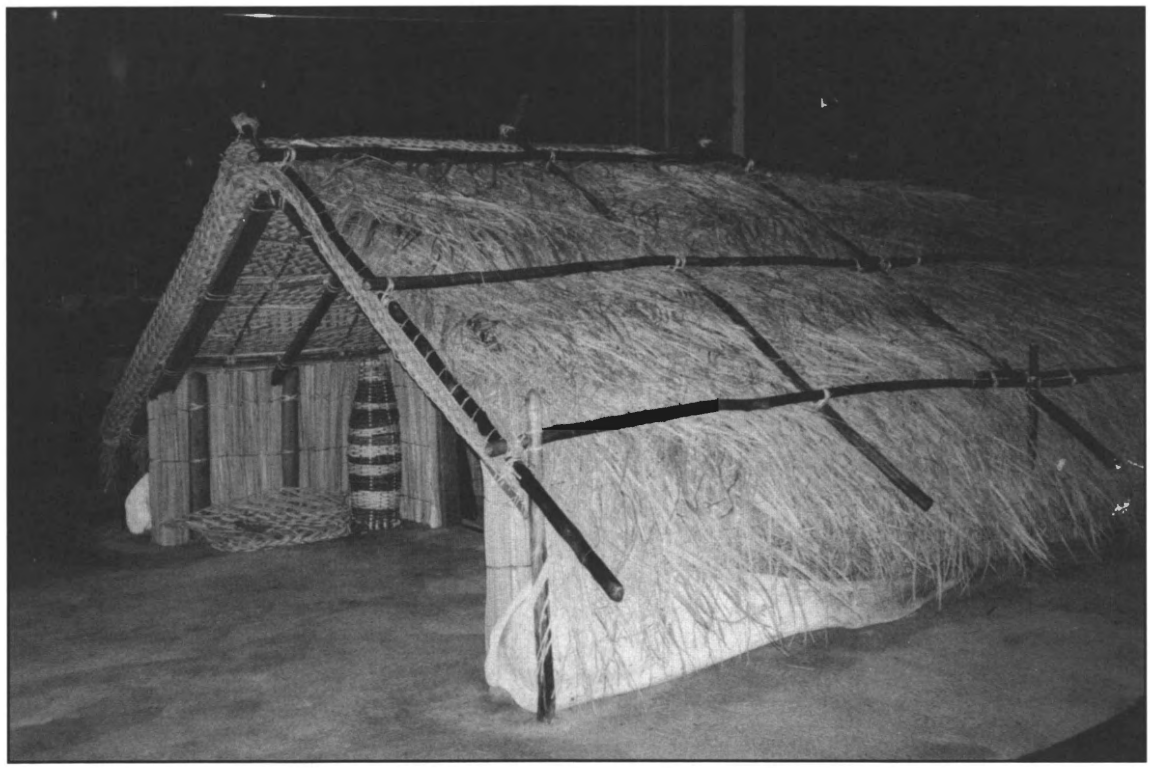

Figure 1. The reconstructed Mãkõtukutuku house in the Museum of New Zealand, Te Papa Tongarewa. Photo: Bruce Treeby

Introduction

During 1996 and 1997 I was involved in a research project assisting Ngãti Hinewaka in the Wairarapa to locate plants that might have been used to build a replica of the Mãkõtukutuku Wharepuni'[1] in Te Papa Tongarewa, the Museum of New Zealand. (Burtenshaw *et. al:* 1999).

As a result of this work and background research we uncovered a great deal of information about the use of native plants in pre-European house construction that was new to me and probably many other people with an interest in native plants. This paper presents a general description of plant materials used in the construction of pre European Mãori houses in the hope that they add to our knowledge about the historical uses of native plants.

Pre-European Mãori Houses

When Mãori immigrants arrived in Aotearoa they had to make the transition from living in large airy houses suited to the tropics to small thick-walled ones to keep them warm in winter. The basic rectangular design remained but it evolved to include a porch at the front and an internal hearth. A solid ridgepole was supported by posts front and back and in the centre and it projected forward to form a small porch. Rafters sloped down both sides and were supported by short side posts. The rafters had battens across them to which thatch bundles

[1] Wharepuni is the name for the common Maori sleeping house of everyday life in pre-European times. The Mãkõtukutuku Wharepuni was a sixteenth century wharepuni in the Mãkõtukutuku Valley in South Wairarapa. The archaeological remains ot the Mãkõtukutuku Wharepuni were excavated by B. F. Leach and a team of anthropologists from Otago University during the period August 1969 to August 1972 (Leach 1979a, 1979b). A replica of this wharepuni has been reconstructed in the Museum of New Zealand, Te Papa Tongarewa.

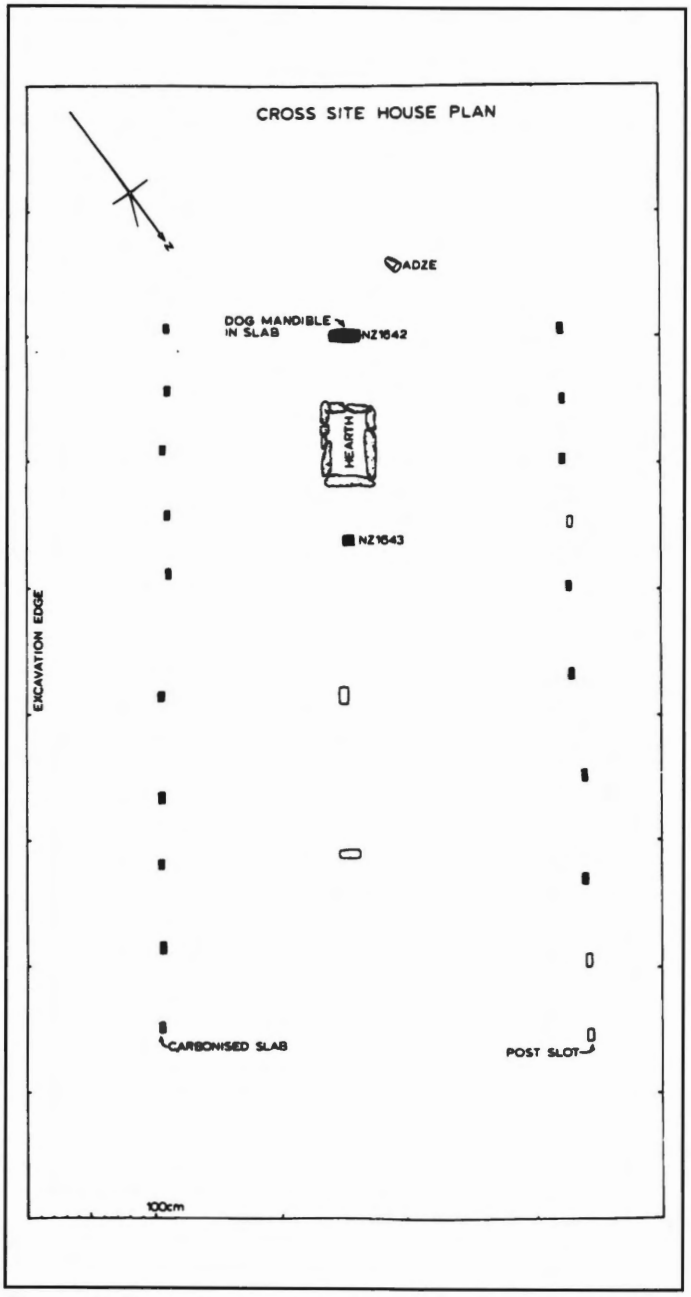

Figure 2. Ground plan of the Mākōtukutuku house (after Leach 1979b: 123)

were attached. The low walls were similarly covered and sometimes soil was heaped against them for greater warmth. A low doorway at the porch end allowed entry on hands and knees and the only window was a small one in the front wall. Smoke from the central hearth on which charcoal was burned had to escape through this opening and a small vent in the roof. The overriding design requirement was to preserve warmth. These houses were used mostly for sleeping during cold weather although people often worked in the porches during the day. In hot weather they usually slept outside under light shelters. All cooking was done in separate shelters with open sides (Orbell *1985: 54-55).*

As well as having the well-built houses of the wharepuni type, Māori also built food storage structures and a variety of temporary structures. In the South Island circular houses were also built but were regarded as a lower class of house than the wharepuni type (Beattie 1994:41). During travel in warmer weather Māori often slept in the open. The common wharepuni type of house is also distinguished from the superior and larger meeting houses called wharenui or carved houses whare whakairo (Firth 1926:54) Such meeting houses were often elaborately decorated with symbolic carvings, kowhaiwhai patterns and tukutuku panels. This paper discusses plant materials used in constructing houses of the wharepuni type but many of the materials and methods described were common to all types of whare construction.

Archaeological and Historical Evidence

Many examples of pre-European Māori house sites have been excavated by anthropologists and archaeologists. Results of these excavations revealed ground plans such as the one for the Mākōtukutuku house shown in Figure 2

The ground plan as shown in Figure 2 is a typical result of archaeological excavations. These excavations usually record only the location of the remains of posts in the soil, hearthstones as well as any artefacts found in the cultural layer[2]. Analysis of post remains can identify the timber species but the evidence of what materials were used on other above ground parts of the houses must be gleaned from the accounts, sketches and paintings of early explorers as well as ethnographic and historical records. Occasional remains of house timbers have been found preserved in lake beds and swamps (Davidson 1984:154). Cross cultural comparisons of construction methods with other parts of Polynesia also provides clues (Hiroa 1927).

A lack of detailed descriptions of pre-European wharepuni along with the fact that Māori were well known for quickly adopting and utilising European technology makes deriving an accurate picture difficult. Knowledge of nails and their use for construction purposes preceded actual contact between Māori and Pakeha in some areas. Construction methods and common house styles changed significantly with the advent of Pakeha materials. The provision of blankets as a trading commodity is also thought to have influenced the type of house construction because there was not the same need for a warm insulated house. Many of the pictures, drawings and descriptions after the 1840's depict houses that are already showing the influence of Pakeha materials and technology.

[2] The cultural layer is the horizon or level in which artefacts or evidence of cultural activities of the occupants is found.

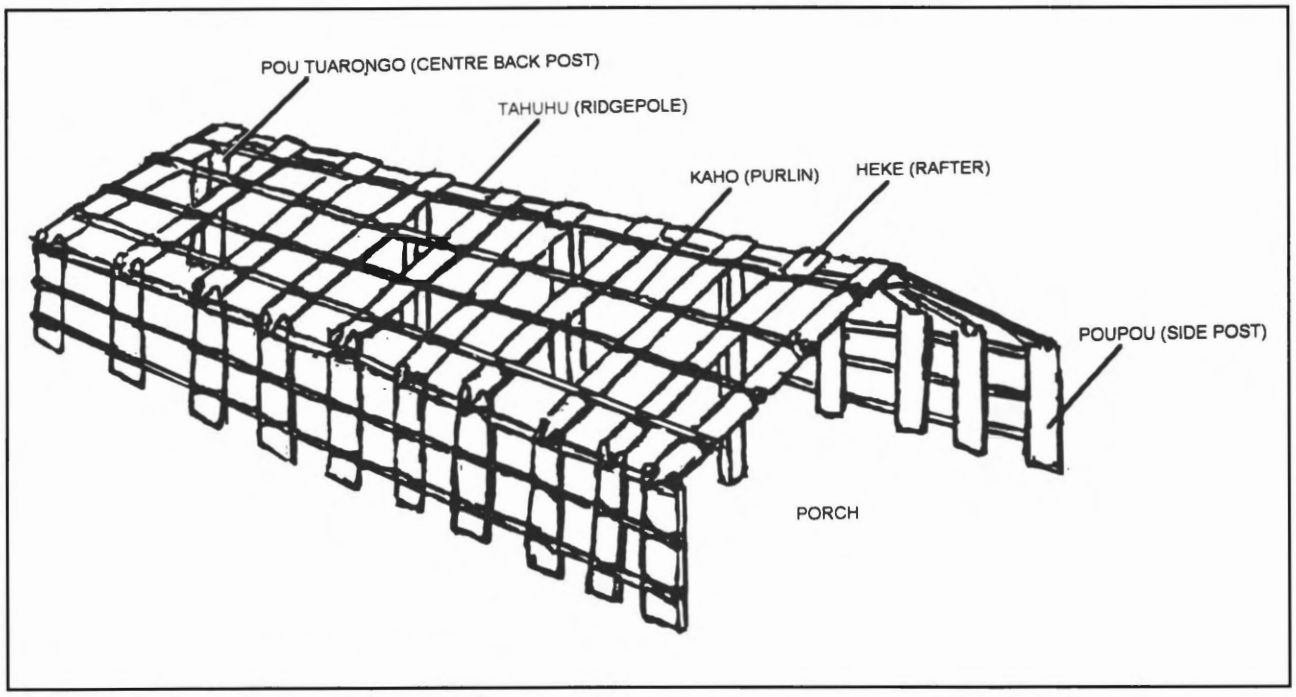

Figure 3. Typical wharepuni framework

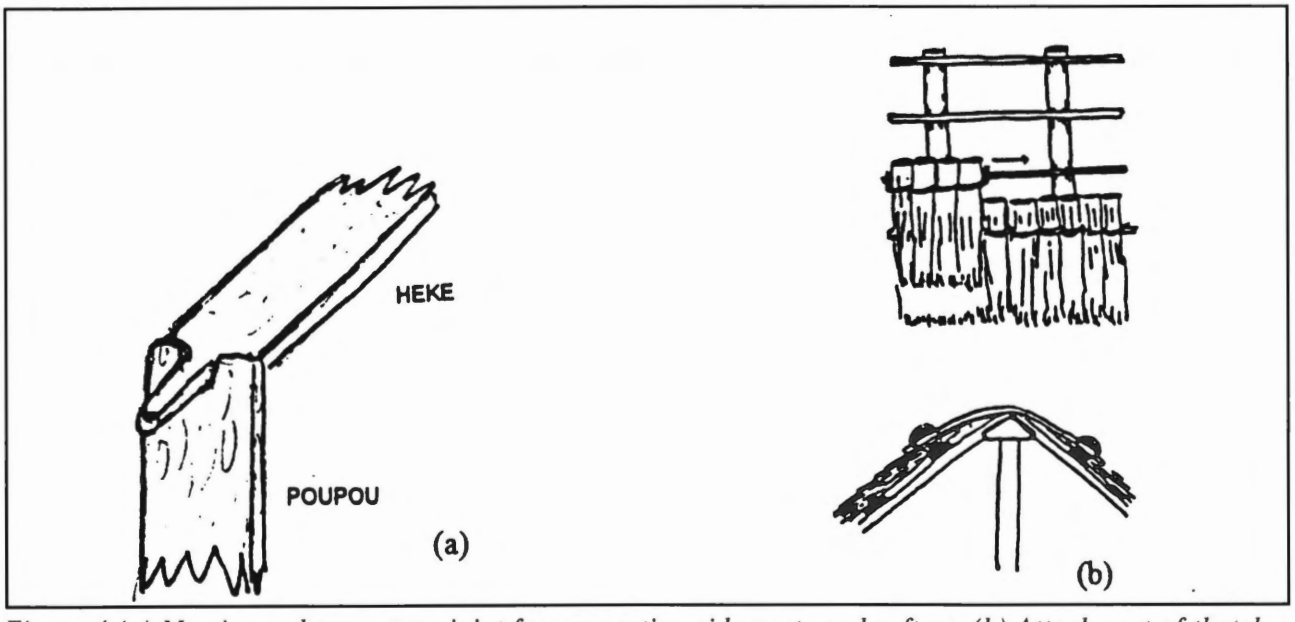

Figure 4 (a) Mortise and tenon type joint for connecting side posts and rafters, (b) Attachment of thatch bundles and ridge cover (after Te Rangi Hiroa 1970:118)

Framework materials

The basic house framework was a structure similar to that shown in Figure 3. Thick central posts (pou) supported a ridgepole (tahuhu) shaped at an angle to allow the rafters (heke) to lie flat on it. The rafters sloped down to short side posts (poupou) on which they were supported. The rafters were either joined to the side posts with a type of mortise and tenon arrangement (Figure 4 (a)) or in some cases supported by a top plate attached at the top of the side posts.

The size, shape and wood structure analysis of post remains indicate that they were commonly adzed tōtara. *Podocarpus totara* was the preferred timber species for posts, rafters and ridgepole. It split easily and stone adzes produced a fine polished finish to the timber. Shark liver oil may have been used to enhance the polished finish. Although *P. totara* predominated, there was no distinction made between the timber of lowland tōtara, *P. totara* and Hall's tōtara, *P. halli* which may have been used where *P. totara* was not available.

While tōtara was the preferred framework timber species, other species recorded as being used for house timbers include kauri *Agathis australis,* rimu *Dacrydium cupressinum,* matai *Prumnopitys taxifolia,* porokaiwhiri *Hedycarya arborea,* pukatea *Laurelia novae-zealandiae,* tōnekaha *Phyllocladus trichomanoides,* toatoa *Phyllocadus glaucus,* tawa *Beilschmiedia tawa* and putaputawētā *Carpodetus serratus.*

The next step in construction was to lash purlins or kaho across the rafters. Long straight poles of mānuka *Leptospermum scoparium* or kānuka *Kunzea ericoides* were used as purlins. Often an upper ridgepole (tahu iti) and a few external poles of kānuka or mānuka were used to secure roof thatch materials in place.

Lashing materials

While techniques, such the mortise and tenon type shown in Figure 4 (a) or recessed notches, were used for joining framing timbers, the joints were held fast with lashing materials. Ropes and cordage made from harakeke, *Phormium tenax* or from various types of aka (vines or creepers) were used as lashing.

Maori named a number of different types of aka that were not always vines or creepers. Akakiekie, for example, was a lashing material obtained from the long aerial roots of kiekie, *Freycinetia baueria.* Long lengths of the roots were harvested, stripped of their outer bark and the tough inner section was split to produce a tough and durable lashing material

Other aka vines, creepers or aerial roots include akakohia *Passiflora tetrandra,* akakiore *Parsonsia capsularis* or *P. heterophylla,* akakopukererū *Clematis* spp., akapuka *Griselinia lucida,* aka pirita *Ripogonum scandens,* akatātarāmoa *Rubus* spp. akatawhiwhi *Metrosideros fulgens,* akatea *Metrosideros albiflora,* and akatoki *Metrosideros perforata.* (Beever 1991)

Thatching and roofing materials

Raupo *Typha orientalis* was the most common used thatching materials although kākaho, the flower stems of *Cortaderia* spp., was also widely used. Kākaho was often used as internal lining. Ponga or mamaku trunks, *Cyathea* spp., were also cut to length and shaped with adzes to form the walls particularly at the rear gable end. Bundles of raupo or kākaho were tightly tied and lashed to the walls.

On the roof the bundles were lashed to the purlins as shown in Figure 4 (b). The usual procedure was to attach a bottom layer of bundles of kākaho, cover this with a layer of loose raupō or toetoe leaves, then attach a layer of raupō bundles which in turn was covered with another layer of loose raupō or toetoe leaves, until the required thickness and waterproofing was achieved.

Sometimes layers of plaited nikau, *Rhopalostylis sapida* fronds were tied on over the other thatch layers to provide extra water proofing. Tōtara bark is also occasionally mentioned as a roofing material (Phillipps 1952: 46-47). Sheets of bark were stripped from trees and used as overlapping roofing tiles. Thick layers of tī kōuka, *Cordyline australis* leaves are also reported to have been used as a water shedding layers. Thus a well insulated and waterproof roof was manufactured for the wharepuni.

These layers of thatching materials were held down with manuka or kanuka poles lashed in place over the final thatch layer.

Doors, windows and other features.

The small doorway of about 60cm by 40cm was of just sufficient height and width to admit a crouching person. It had a substantial sill with a groove in which a sliding timber door could be slid open and shut. The doorframe was adzed timber as was the small window frame located higher up in the front wall. Looking out from inside of the wharepuni the doorway was usually on the right and the window on the left although this is not a universal feature of the wharepuni type of house.

On some houses, particularly those of high ranking individuals, barge boards (maihi) covered the front gable. The barge boards were supported at each side by frontward facing posts called amo. The join of the mahi at the apex was covered with a carved figure or tekoteko. The preferred timber for doors, frames, mahi and tekoteko was totara. The extent to which carving was used on the wharepuni type of house varied from region to region and was most commonly reported in Northland and on the East Coast of the North Island.

The larger elaborately carved houses (whare whakairo) and meeting houses (wharenui) were mainly a product of the nineteenth century when larger settled Māori communities developed.

Conclusion

A typical pre-European Māori house would resemble the one shown in Figure 1. Plant materials identified as used in constructing such houses is derived mainly from historical and ethnographical records and, although the general design and layout of houses was generally adhered to throughout New Zealand, local variation in construction methods and materials used was probably the rule. The main determining factor being the local availability of materials. However the design also included "important symbolic and social aspects which ensure that the 'built' environment is fundamentally conservative" (Prickett 1987: *95-96).*

Hopefully the information assembled in this paper presents some new insights into the historical use of native plants. For easier reference, the plant materials used in pre European Māori house construction are summarised in the following table.

Table: Summary of plant materials commonly used in wharepuni construction

Botanical name	Maori name*	Construction use
Agathis australis	kauri	Occasionally as framework timber
Beilschmiedia tawa	tawa	Occasionally as framework timber
Carpodetus serratus	putaputaweta	Occasionally as framework timber
Clematis cunninghamii	ngakau-kiore	Vines as cordage (akangakaukiore)
Clematis paniculata	puawananga	Vines as cordage (akakopukereni)
Cordyline australis	ti kouka	Leaves as thatching
Cortaderia spp. *C. fulvida, C. richardii, C. toetoe*	toetoe	Culms (kakaho) as thatch bundles and leaves as loose thatching
Cyathea dealbata	ponga	Trunks as wall lining
Cyathea medullaris	mamaku	Trunks as wall lining
Dacrydium cupressinum	riniu	Occasionally as framework timber
Freycinetia baueria	kiekie	Roots as cordage (akakiekie)
Griselinia lucida	puka	Roots as cordage (akapuka)
Hedycarya arborea	porokaiwhiri	Occasionally as framework timber
Kunzea ericoides	kanuka	Purlins, Upper ridge poles, thatch poles
Laurelia novae-zealandiae	pukatea	Occasionally as framework timber
Leptospermum scoparium	manuka	Purlins, upper ridgepoles, thatch poles
Metrosideros albiflora	akatea	Vines as cordage (akatea)
Metrosideros fulgens	ratapiki	Vines as cordage (akatawhiwhi)
Metrosideros perforata	torotoro	Vines as cordage (akatorotoro)
Parsonsia capsularis	kaiwhiria	Vines as cordage akakiore)
Parsonsia heterophylla	kaihua	Vines as cordage (akakiore)
Passiflora tetrandra	kohia	Vines as cordage (akakohia)
Phormium tenax	harakeke	Cordage and ropes
Phyllocladus glaucus	toatoa	Occasionally as framework timber
Phyllocladus trichomanoides	tanekaha	Occasionally as framework timber
Podocarpus hallii	totara	Occasionally as framework timber
Podocarous totara	_____	Common framework timber, bark as thatching
Prumnopitys taxifolia	_____	Occasionally as framework timber
Rhopalostylis sapida	nikau	Fronds as thatching
Ripogonum scandens	_____	Vines as cordage (aka pirita)
Rubus spp. *R. australis, R. cissoides*	tataramoa	Vines as cordage (akatataramoa)
Typha orientalis	_____	Loose and bundled as thatching

* Most of the information about Maori plant names and plant materials is derived from Beever (1991).

Note that I have used macrons to indicate the long vowel sound for Maori names throughout this paper. These are important for correct pronunciation of Maori words.

Acknowledgements

I would like to thank Haami Te Whaiti for permission to use the photo of the Mākōtukutuku Wharepuni and Mike Rudge and Graham Harris for editing assistance.

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Observations on magnolias at Lincoln University

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Introduction

In the winter of 1990 the nucleus of a *Magnolia* collection was planted at Lincoln University. This was in a block within the Horticultural Research Area no longer required as a stool bed for producing apple rootstocks. Additional plants were purchased in 1991 and 1992. These replaced a smaller existing number of established magnolias, removed to make way for the then new Commerce Building. After 1992 further development was slow until a grant was given by the Brian Mason Scientific & Technical Trust to increase the collection. In June 1998 the Brian Mason Scientific & Technical Trust awarded a grant of $5000 for additional plant material and labelling. With that grant the collection has been broadened from magnolias to include other genera and species within the Magnoliaceae family. The collection now includes approximately one hundred and twenty plants from four genera; *Magnolia, Manglietia, Michelia* and *Liriodendron.*

Three other lesser known genera; *Elmerrillia*, *Kmeria* and *Pachylarnax* also belong to the Magnoliaceae family, but are not represented in the collection. The closest New Zealand examples includes *Pseudowintera* species which at one stage were regarded as being in the Magnoliaceae, but are now classified in the closely related Winteraceae family.

Much of the early plant material was purchased from Duncan and Davies Nurseries Ltd. In New Plymouth. Latterly additional material has been procured from Cave's Tree Nursery in Hamilton. Two Lincoln University Forestry lecturers, Dr. Mead and Dr Chang, who visited China in 1997 arranged a contact there to obtain seed of species that were not in the collection. Unfortunately this contact wanted to charge $500 US per species for seed. So that potential source was quickly rejected. (They also offered to provide the seed quickly on receipt of a deposit of $2500 US). Currently there are still a number of species that will be added to the collection when we are able to source the seed or plants. Most of the species within the Lincoln University collection are native to temperate eastern Asia and North America.

A second grant of $7000 has recently been awarded by the Brian Mason Scientific & Technical Trust for further development of the Magnoliaceae collection and work which Dr Anthony Mitchell has carried out to look at other ways of identifying plants within the collection by DNA fingerprinting.

Rabbits and other challenges

Rabbits and to a lesser extent hares are the major pests of the collection at Lincoln. Rabbits are extremely active throughout the year, but are particularly noticeable during the winter months when they attack the roots of the magnolias. They also attack unprotected young plants by chewing young stems, breaking and or ring barking them. Occasionally hare damage is evident where newly planted trees have had shoots nipped off. In late spring of 1998 the rabbit numbers dropped off substantially and it was assumed that rabbit calicivirus could have affected the rabbit population at that time. Rabbit numbers now appear to be building up again. Rankin in the UK.(1993) wrote "Rabbits. Magnolias must be their ultimate delicacy. They have been known to strip the bark off quite mature plants. If rabbits are present, protect the base of the plant with wire netting immediately after planting". De Spoelberch (1998) in discussing the development of a collection of nearly 800 magnolias at Herkenrode 25km north of Brussels in Belgium suggests "mice, hares and rabbits have been a constant problem, but eventually a fence was placed around the entire collection and the rabbits and hares shot." He goes on to suggest "mice can ring bark plants where mulch or ground cover plants grow up to the base of the trees and provide shelter and protection". On rabbits again "In parks which have become rabbit infested, big magnolia shrubs and even old trees of *Magnolia acuminata* and *Liriodendron tulipifera* will be completely ringed over one winter by starving rabbits. It is quite extraordinary to see the thick bark of a *Liriodendron* patiently scraped away until the last tender cambium layer can be reached". Any new plantings of the Magnoliaceae at Lincoln University are now routinely protected with wire cages for a few months as a protection against rabbits and hares. Shooting has also been carried out in the past.

Magnolia production systems

It appears that most magnolias are grafted on to seedling rootstocks. In my experience this may not produce the best results and there have been many instances of magnolias showing reversion to the rootstocks. This is easily observed when the plants are in flower, as two different types of flowers or colours may appear on the same plant. In one instance where a plant of *Magnolia acuminata* 'Golden Glow' was grown it flowered the second and third year from planting, but the scion died after flowering in the third year. In the spring of the

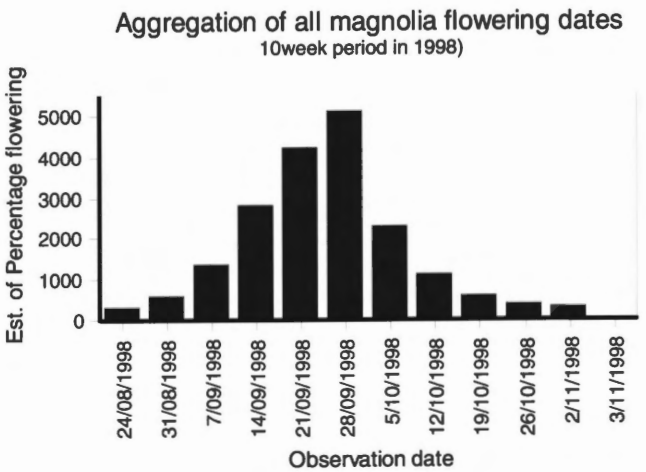
third flowering I observed a black exudate oozing from the point of the graft union. While I did not do anything about this at the time, it appeared this was indicative of delayed graft incompatibility. The rootstock however did not die and has since flowered with extremely large flowers that appear to be of Asiatic hybrid parentage. The flowers of this rootstock are up to 270mm across and unlike any other *Magnolia* x *soulangeana* I am familiar with. *Magnolia acuminata* however is a North American species. (Recent DNA analysis work by Dr Mitchell at Lincoln University has shown this may be a *Magnolia* x *soulangeana* hybrid). In discussing the ethics of selecting rootstocks, J.G. Millais in his 1927 monograph -the first ever written on magnolias, states. "Those who are forming gardens should always give magnolias their first consideration when planting, and put in two or three examples of all the best species and hybrids that can be procured **on their own roots".** From my observations so far I would endorse that suggestion and encourage nurserymen to consider trying cutting grown plants, rather than grafted plants. Wilkinson (1978) however, suggests genera such as *Magnolia* are notoriously difficult to produce roots from cuttings. If grafting is to be considered necessary, then at least use rootstock species that closely match the scion. More recent authors such as Callaway (1994) suggest most of the magnolias grown today are from cuttings. De Spoelberch (1998) states "Too many magnolias in old collections are but stock which has sprouted back after the scion has been killed by frost. Cuttings are much better than grafted material, more than half of our accessions are cuttings taken from the plants that have performed best here".

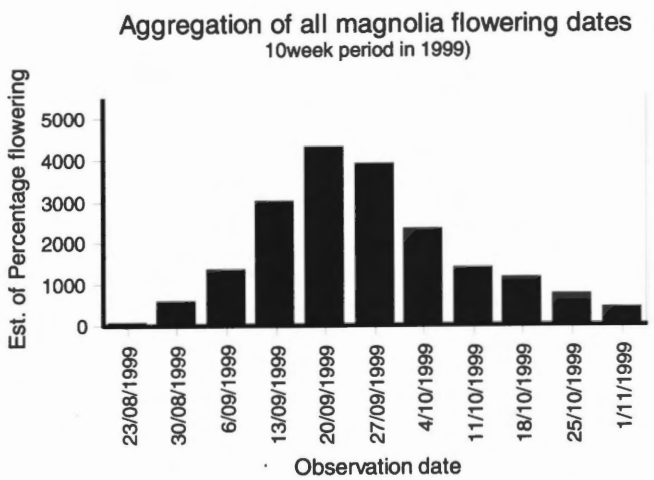
Pruning

To date very little pruning has been carried out on any of the magnolias in the collection with the exception of storm damage, weak crotch angles or removing errant rootstock growth that has developed at the expense of the scion. The latter has usually been cut from tagged branches soon after flowering. The different flowers of the rootstock and scion make it easy to select the material for removal. In a few cases, some heavy pruning has been carried out to remove branches with weak crotch angles to prevent future problems. Where heavy pruning has been carried out there has been a response by the plants in producing a large number of shoots. These need to be cut out very early. It is better to avoid heavy pruning by correcting branch angles or removing unwanted shoot growth as early as possible. Flower initiation for most spring flowering magnolias appears to occur in early summer so to avoid potential flower loss, prune as soon after flowering as possible. De Spoelberch, 1998 states "Pruning is essential when transplanting magnolias and removal of most of the lateral branches is carried out leaving only one leader, even if the plant will end up as a shrub."

Flowering

Since 1998 I have been fortunate to have Mr Bruce Palmer work on a voluntary basis to assist with the management of the area. Bruce also recorded flowering on a weekly basis. Flower records were based on an estimate of flowering for each plant in flower on that day. From those records information has been put into a database and a graph for each species showing expected flowering times can be produced. By aggregating all of the flowering records kept for 1998 together, the best two weeks to have visited Lincoln in 1998 to view magnolias was in the weeks starting the 21st and 28th September. For 1999 the best two weeks started the 20th and 27th September. Bruce Palmer is continuing to record magnolia flowering this year at Lincoln University and Kristian Davies of the Auckland Botanic Gardens kept flowering records of *Magnolia kobus* var. *stellata* 'King Rose' for 1999. This has enabled us to get an overview of the likely differences in flowering period by comparing the same cultivar between the two sites.





Once we have sufficient flowering records, flowering times can be compared with past climate data and we may then be able to predict when flowering will occur on the basis of heat unit accumulation after flower initiation. Comparisons of flowering times with other species at Lincoln University and with Auckland Botanic Gardens and with climatic data of both regions to determine heat unit accumulation will help fine tune the results. From observations to date it is possible to have some magnolias in flower in Canterbury from July to May, nine to ten months of the year.

Frost damage to flowers

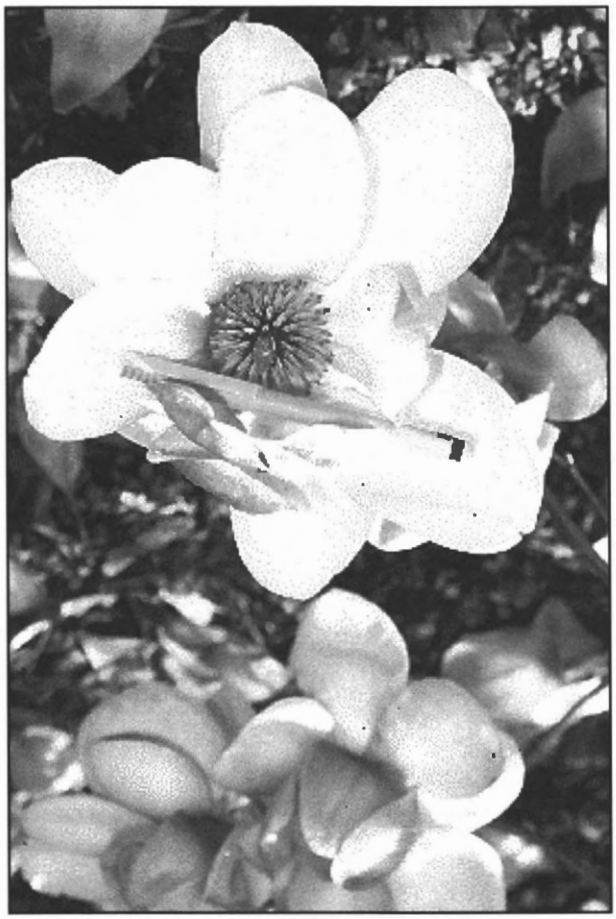
Early flowering plants can be susceptible to damage by frost. Frost damage is observed as a browning or blackening of the perianth prematurely, effectively reducing the amenity values of that plant. The tepals (tepal is a term coined by Johnstone for units of the perianth that are indistinguishable as either sepals or petals. The outer hairy units are perules, which enclose spathaceous bracts outside of the tepals. (Treseder, 1978) then fall within a few days. From my observations not all flowers open at once, flowering is usually a progressive event and frost damage tends to only destroy the flowers that are open, buds enclosed by the large hairy perules seem to be protected and these subsequently open later. If the temperatures remain low for a few days it appears as though flowering is also delayed, resuming as temperatures increase. The most severe frost damage is usually in September although this year with very early flowering of *Magnolia* 'Serene' frost damage has been observed in late July. The second flush of flowering then appeared to delay for a period of about ten days before flowering resumed.

Pollination and seed set

A number of seedlings grew during the last summer. These were tagged with the intention of lifting and bagging the seedlings in the early winter. Rabbits or hares it seems took every seedling in late autumn 1999, leaving just a few decapitated seedlings as evidence. This summer *Magnolia sieboldii* has produced numerous seedlings (approx. 80 plants have been potted up) growing in the bark mulch beneath the branch spread. Any other tree in the collection has only ever produced a few seedlings at most. Magnolias are protogynous plants, the carpels mature before the anthers are ready to release pollen within the same flower. In order for pollination to occur pollen must then be brought from another flower where the stamens have released pollen. Soon after the pollen has been released from the stamens appear to collapse. At this stage thrips, honey bees and a type of fly have been observed on the flowers.

Selecting the 'best'

Rankin, 1993 states "I was once told by an eminent plantsman that 'every magnolia is beautiful yet some are superior." There appears much truth in that statement, my personal favourites are the Asiatic magnolias as a group and within those there are many fine options. In terms of beauty *M. sprengeri* 'Diva' has always impressed me, for fragrance *M.* x *weisneri* is superb. In terms of beauty and reliability in Canterbury the *M.* x *soulangeana* and *M. stellata* are hard to beat. This brief summary however leaves out *M. denudata* and M. *liliiflora* both of which are hardy in Canterbury and beautiful in their own right. As an aside these are the parents of *M.* x *soulangeana* from which a number of fine cultivars have been selected. How do you leave out of any discussion of magnolias the early flowering magnolias such as *M. campbellii* or the serenely beautiful flowers of *M. sargentiana*? At this point I should give up, but in finishing will briefly touch on some of the NZ raised hybrids such as those of Felix Jury, plants such as *M.* 'Serene', *M.* 'Vulcan'. *M.* 'Iolanthe', *M.* 'Apollo' and *M.* 'Mark Jury' to name but a few. These are all large flowered hybrids. Others such as 'Star Wars' (a NZ. cultivar selected by Oswald Blumhardt) and 'Royal Crown' greatly extend the flowering period and all are well worth growing. For something different the large leafed *M. macrophylla* flowers in late November and into December. This plant has deep pudding plate shaped flowers to about 25cm in diameter. All the above covered are white, cream or pink shades through to deep rich purple. There are other magnolias now available that have yellow flowers. Flowers such as those of *M. acuminata* 'Golden Glow', *M.* 'Yellow Fever' (an unfortunate name), *M.* 'Elizabeth' and *M.* 'Yellow Bird' are possibilities worth growing. *M. acuminata* one of the parents of most of the yellow flowered hybrids is a deciduous North American tree which needs a lot of space. Another North American species well worth space in the garden is *M. grandiflora.* This species is evergreen and produces large lemon scented flowers over the summer, a few at time until frosts occur. There are also number of selected cultivars of *M.grandiflora* as well as hybrids between this and *M. virginiana* another North American species.



Picture of 'unknown' rootstock of *Magnolia acuminata* 'Golden Glow', recent DNA analysis by Dr Mitchell has shown the rootstock to be a *Magnolia* x *soulangeana* hybrid.

Adapted from notes prepared for The Friends of the Christchurch Botanic Gardens Inc. at a presentation given on 10th November 1999 at the Information Centre, Christchurch Botanic Gardens.

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Joseph Pierre Buc'hoz

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"Miserrimus compilator, fraude ac ignorata aeque eminens..."

J.P Buc'hoz has long had a bad press. G.A. Pritzel (quoted above) had no time for him. Monfalcon said of his books that "il n'en est aucun qui ne soit au-dessous du mediocre" (there is not one which is more than mediocre). F. Kirschleger said much the same: "Les publications de Buc'hoz n'ont qu'une valeur trop mediocre." The French botanist Charles-Louis L'Heritier de Brutelle established (unfortunately, not validly) a new genus *Buchozia* "to take revenge" because it had a foul odour and was therefore excellently suited for that particular purpose. Wilfrid Blunt dismissed Buc'hoz by quoting anonymous authors as saying that Buc'hoz wrote on all branches of natural science without understanding any one of them and that no word he ever wrote contributed anything to the world's sum of knowledge. Blanche Henrey said of his works that "none contributed anything to the advancement of science." Could Buc'hoz really have been *that* bad?

J.P. Buc'hoz (who, typically, preferred to reverse his Christian names and thus appears in the literature as P.J. Buc'hoz, sometimes spelt without the apostrophe as Buchoz) was born in Metz, Lorraine, in 1731 and practised as a lawyer and then trained in medicine, being at one stage Physician in Ordinary to Stanislaus, King of Poland. He soon gave up these professions to become a writer and a publisher. By the time he was 46, Buc'hoz had already produced some 260 titles and in all his works exceeded 500 in number, nearly 100 of which were folios of handcoloured prints. He managed to produce so many largely because he compiled his texts from the publications of others and was also prone to copying drawings without authorisation. Furthermore, he copied himself: "He has a maddening way of using the same plate again and again and again, in book after book - sometimes colored, sometimes uncolored, sometimes badly colored, sometimes reversed, sometimes redrawn, sometimes with added details, sometimes with changes of nomenclature." (Allan Stevenson in *the Hunt Botanical Catalogue*, Vol. II, pt. II, 1961.) It is no wonder that he is the despair of bibliographers. In some cases, only one copy of a work survives, in other cases individual copies will vary in the title page, the number of plates, the numbering and the order of plates and in what text there is. Successive editions of the one work could appear as parts of other publications with quite different titles. His works were inaccurate and he often had very little understanding of his subject matter. His nomenclature was unreliable and his citations frequently inadequate or just plain wrong. Indeed, his contemporaries treated his works with derision and refused to accept his binomials.

Figure 1. Plate LXXXXVII from J.P. Buc'hoz *Collection Précieuse et Enluminée des Fleurs les plus Belle et les plus curieuses, que se Cultivent, tant dans les Jardins de la Chine que dans ceux de l'Europe...* first published in 1776, 283 X 200 mm (including gold border)

Buc'hoz was unsuccessful as a publisher - the public did not buy his books even when they were produced anonymously. His wife died and he suffered during the Revolution. In old age and penury he was rescued by a friend of his wife, and she married him to maintain proprieties. He died in 1807.

Despite all the complaints that have been laid against Buc'hoz, there is no doubt that many of his prints are charming and very decorative, even if not botanically correct. Sets of his plates are now very collectable and indivdual plates usually reach $NZ400 - $500 each. I particularly like his plant studies based on paintings made in China. These are largely from the first volume of *Collection Précieuse et Enluminée des Fleurs les plus Belle et les plus curieuses, que se Cultivent, tant*

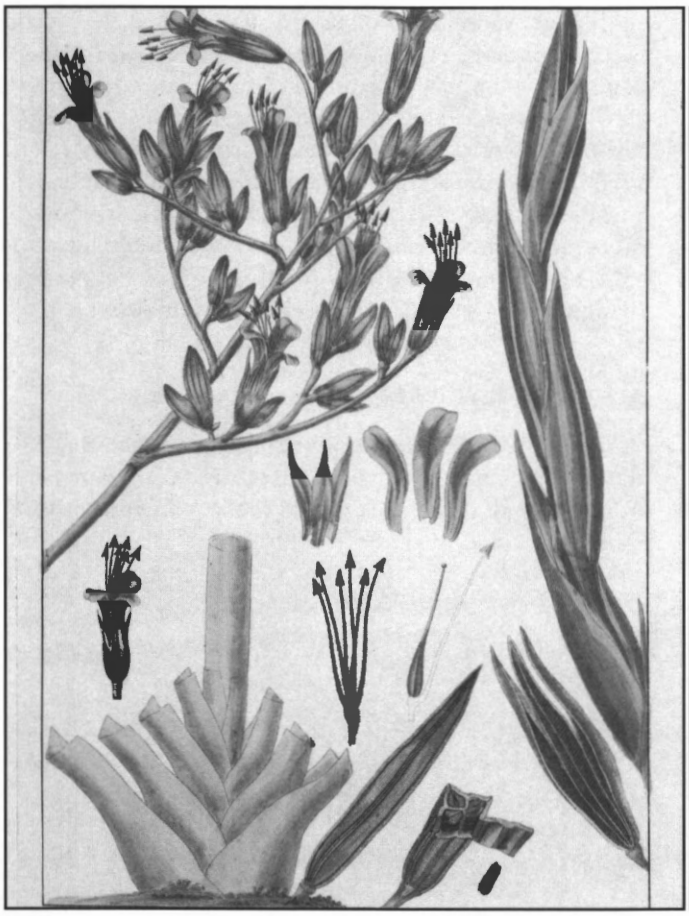

Figure 2. Plate LXV: Phormium tenax. *Forster. Le Chanvre de la Nouvelle Zelande*. from J.P. Buc'hoz *Le Grand Jardin de l'Univers, où se trouvent coloriées les Plantes les Plus Belles, les Plus Curieuses et les Plus Rares des Quatres Parties de la Terre*...published in parts between 1785 and 1791, 297 X 191 mm. Chanvre is French for hemp. The plate of Buch'hoz is largely a mirror image of the plate in Miller.

3. John Miller's engraving of *Phormium tenax*, Tab. II, from *Icones novae*, 1780, copy held by the Royal Horticultural Society, London.

dans les Jardins de la Chine que dans ceux de l'Europe... first published in 1776. The plates are characteristic of the first "export" paintings from China and are typically Chinese in their colouring, and their treatment of such aspects as the rocks and the sky. Delightful birds, butterflies or other insects, probably as fancifully depicted as the plants themselves, accompany almost all of the plant studies. The yellow border simulates the gold leaf often found around earlier watercolours of natural history subjects. The example shown in Figure one was bought in Hong Kong about five years ago. Underneath the plate are two Chinese characters that indicate the particular plant being portrayed.

In 1996, I acquired two other Buc'hoz prints from an antiquarian gallery in London. There were no details as to the source, but the plant, the New Zealand flax, *Phormium tenax*, would have been immediately identifiable even if had not carried an inscription. A little detective work using standards texts such as *Index Londinensis*, and searching through the collections of the British Museum, Natural History and the Lindley Library, Royal Horticultural Society revealed that this plate (No. LXV) of *Phormium* and a accompanying plate (No. VII) of *Strelitzia regina* (here entitled *Heliconia Bihai)* were from *Le Grand Jardin de l'Univers, où se trouvent coloriées les Plantes les Plus Belles, les Plus Curieuses et les Plus Rares des Quatres Parties de la Terre*...published in parts between 1785 and 1791. During my searching, I was initially misled into thinking that the plates had come from another work, a publication by a much more distinguished botanist, John Miller (Johann Sebastian Müller, 1715 *c.*1790). Miller had prepared *An Illustration of the Sexual System of Linnaeus (Illustratio Systematis Sexualis Linnaei)* published between 1770 and 1777. Full descriptions of the flowers were included on the plates because flower structure is so important to the new classification as devised by Linnaeus. In 1780, Miller had published additional plates *Icones Novae*, which, if held, many libraries have bound

with his *Illustration of the Sexual System of Linnaeus. Icones Novae* is a small beginning to what was intended as a much more ambitious work: it consists of only seven plates but these are most interesting, including plates of *Phormium tenax*, *Sophora tetraptera* and two of *Heliconia bihai*. These were blatantly plagiarised by Buc'hoz. The plate of *Phormium*, for example, is an obvious copy from Miller, although the layout is slightly different, the colouring of the plant parts is less accurate (although hand-coloured works can typically vary greatly) and the inflorescence has been simplified. The image has been reversed, presumably in the copying process. The general effect is somewhat crude, but it must be admitted that Miller's flax is less successful than most of his other plates.

The newly discovered plants of New Zealand had aroused great interest in Europe and many were to be depicted in scientific publications from the time of Cook. The plates of *Phormium* and of *Sophora* in Miller and in Buc'hoz are amongst the earliest representations. The most comprehensive of the early illustrations were those prepared for Banks after Cook's first voyage, but most of these engravings were not published for more than two centuries. One of the most attractive early representations of a New Zealand plant is also of flax. An engraving based on a drawing by William Hodges, appeared in James Cook's account of his second voyage, *A Voyage towards the South Pole, and Round the World. Performed in his Majesty's Ships, the Resolution, and Adventure, in the Years 1772, 1773, 1774, and 1775...* To my mind, this is a much more attractive rendition than those of Buc'hoz or even Miller: the plant has real life and grace and is one of the finest illustrations of flax ever published.

Botanists have generally scoffed at Buc'hoz but his works should not be dismissed too readily as they can clarify nomenclatural issues dating back to the early period when Linnean nomenclature was becoming established. Some of Buc'hoz's own binomials have to be taken seriously as they were undoubtedly validly published and in some cases the accompanying illustrations are accurate enough to be considered as lectotypes. Buc'hoz, of course, was never noted for botanical accuracy and there has been extensive debate as to which illustrations are indeed sufficiently accurate. A good example is the debate over the nomenclature of the two well-known magnolias, the yulan and the mulan. The earliest applicable names appear to be those of Desrousseaux, *Magnolia denudata* and *M. liliiflora* respectively, but it has been suggested that illustrations by Buc'hoz of these two magnolias in *Collection Précieuse et Enluminée des Fleurs* ... reprinted with descriptions in another work of 1779, *Plantes nouvellement découvertes, récemment denommées et classés, représentées en gravures, avec leur descriptions...*, are sufficient to warrant adopting the earlier published binomials transferred to the genus *Magnolia* as *M. heptapeta* (Buchoz) Dandy and *M. quinquepeta* (Buchoz) Dandy. Frederick Meyer and Elizabeth McClintock present a full discussion in *Taxon* 36 (1987): 590-600, concluding that these particular illustrations by Buc'hoz are simply inadequate for nomenclatural purposes being "without any conceivable scientific value whatsoever" and that "the flower details are totally incorrect and fictitious for *Magnolia*." Yet another condemnation of Buc'hoz as botanist and artist.

Acknowledgements

Martin Heffer (HortResearch) photographed the Buc'hoz plates. The engraving from Miller's *Icones novae* is reproduced with the permission of the Royal Horticultural Society of London.

The Role of Native Plant Collections - A Blueprint for the Future

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Historical background

It was soon after Cook's first voyage with Banks and Solander in 1769 that the first New Zealand plants found their way back to Europe and into botanical collections at Kew Gardens. *Phormium tenax* and *Clianthus puniceus* found their way into collections and were two of the first plants illustrated in Curtis' Botanical magazine.

In New Zealand the first major native plant collection was established in the Christchurch Botanic Gardens. In 1867, soon after the gardens were established, John Armstrong was appointed as the second Government Gardener and during his 22-year tenure was assisted by his son Joseph (Christchurch BG management plan) . By 1875 they had established a native section of the Garden. According to Leonard Cockayne (Cockayne 1911), the Armstrong's recognised the value of the plants for horticultural purposes, and used their collection as a living museum of plant material which students could consult. It is interesting to speculate what influence this collection would have on Cockayne when he proposed the development of a national collection of native plants at Otari 10 years later. Armstrong published many scientific papers based on his work with the collection. The collection grew to 500 species including the largest collection of New Zealand Veronica species.

At the same time, native plant collections were being developed in other New Zealand botanic gardens. In Dunedin, the Gardener Alexander Begg reported in 1865 that *"I have now distributed upwards of thirty collections of native seeds, each containing upwards of seventy different varieties , to nearly all parts of the world, for which I am now receiving ample returns"*

In the Wellington Botanic Garden there was also much interest in establishing collections of NZ plants. The Botanic Garden Board supported collectors such as Henry Travers, John Buchanan and Thomas Kirk in their plant collecting trips and by 1877, there were 63 introduced native species. The Garden like others in New Zealand also sent native plants overseas and in 1882 –3 collections of plants and seeds were sent to Botanic Gardens at Kew, Jamaica, Hobart, Washington, and Melbourne.

Private collectors were also establishing plant collections including William Alexander Thomson of Halfway Bush, Dunedin. Over a period of 40 years in the early 20th century he established a major plant collection at FernTree House containing over 1200 species, most collected by himself.

Native plant material was sent overseas in large quantities during the nineteenth century. Charles Nelson (1989) described the major role NZ plants have played in the horticultural development of English and Irish gardens. Few NZ species were introduced into European gardens before 1840. In 1839 77 lots of New Zealand seed were given to Kew and other lots with 90 and 56 species came in 1841. The Irish Nursery of Rodger, McLelland and Co offered seventeen NZ species and cultivars for sale in 1879. Many commercially available cultivars at this time had French names suggesting they were raised there.

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In the United States, too the flow of plants was two way. During the nineteenth century many America species were imported into New Zealand for economic purposes. Importation of NZ plants into North America began in 1860 with pohutukawa, now one of San Francisco's most popular street trees. In 1915 the Panama Pacific International Exposition took place in San Francisco. New Zealand mounted a major display as part of this, which included a large selection of New Zealand native plants. Following the Exhibition, the NZ Government gifted 150 plants to Golden Gate Park. These became the basis for a NZ collection in the Strybing Arboretum, one of the most important offshore NZ plant collections. In 1936 the Strybing inventory listed 289 NZ woody taxa in 89 genera.

An historical summary would not be complete without some mention of Dr Leonard Cockayne. Dr Cockayne recognised the importance of plant collections as a resource for researchers in systematic botany as well as their role in encouraging the use of native plants in horticulture. He established his own experimental garden at his home in Sumner , Christchurch. Later, after his move to Wellington it was Cockayne, along with JG McKenzie, Director of Parks and Reserves who established a major national resource at Otari in 1926.

Otari Open Air Native Plant Museum: Otari was a large reserve partly covered in native forest in the Wellington suburb of Wilton. Cockayne saw its potential as a national botanic garden. Along with JG McKenzie, Director of Parks for Wellington he commenced development

TABLE 1: NEW ZEALAND COLLECTIONS

Collection	Established	Objectives	Major plant groups	Total number of taxa/accessions	records	collection policy	Threats
Landcare Research, Lincoln, Canterbury	1954	**Research**, large cultivar collection. Material changes from time to time depending on research being carried out.	Coprosma (54cvs), Corokia (14cvs), Pittosporum (46cvs), Hebe (119cvs), Phormium (61cvs)	Over 650 species	Yes, electronic	No written policy	Once research projects finished some plants are surplus to requirements. These are usually offered to other botanical institutions such as Christchurch Botanic Gardens.
Grounds Department, Victoria University of Wellington	1988	**Landscape values**, **education** primarily for students studying courses in biological sciences	Phormium (36cvs from Rene Orchiston collection) , divaricates (25spp.), Chatham Islands (12spp.), Cordyline (4spp, 9 selections).		Yes, electronic	No. NZ planting policy applies on campus	• University expansion taking grounds for new buildings. • Future focus and priorities for University
Auckland Regional Botanic Gardens	1975	• **Conservation**, particularly in threatened species recovery programme • **Education** • **Amenity**	Phormium, Leptospermum, Metroideros, Lepidium, Hebe.	about 1200 accessions	Yes, electronic. Full species list provided	General collection policy. Plant Conservation Policy for ARBG.	None
Fernglen Native Plant Gardens, North Shore City	1950's	**Education** and **conservation**	Ferns and sub alpines. Outlying islands.	about 300 species	Yes	Management Plan. This has some broad policy statements	North Shore City have taken over the garden and ensured its survival and future development. Formerly the private home and collection of Muriel and William Fisher.
Massey University Grounds		• **Education** • **Research** • **Amenity**	Wide range of plants suited to the conditions. Large forest remnant.	Over 400 species and cvs.	Yes	No formal policy	
Pukekura Park, New Plymouth		Education, Amenity	Ferns (110 spp.), Phormium (Orchiston)	Not given	Yes	Formal policy being developed	Lack of skills
Otari - Wilton's Bush, Wellington	1926	• **Education** • **Conservation** – species recovery programme with DOC. Wellington Plant Collections network. • **amenity**	Taxonomic collections, geographic collections, alpine and rock garden plants, threatened species,	over 3000 accessions	Yes, electronic. Full accessions list supplied	General collection policy. Individual policy for each collection.	Pressure on funds through annual plan funding.
Christchurch Botanic Gardens, Christchurch	1875	• Education • Conservation • Amenity	Cockayne Memorial Garden, Hebe (86spp, 65cvs.), Phormium (29cvs.), Pittosporum (14spp., 22 cvs), Sophora (5spp., 3cvs.), Leptospermum (2spp.,10cvs.), Lophomyrtus (2spp., 10cvs.), Olearia (24spp., 5cvs.). Ferns (50spp.). Theme areas include NZ Lake, NZ Bush, River margin and Dryland, rock Garden, alpine plants.	<650 spp & <250cvs	Yes	Yes. Specific policies for each theme area.	

Dunedin Botanic Garden, Dunedin	1865	Education and conservation	Alpine plants, Asteraceae, Hebe (95 spp.), Coprosma (37 spp.), Brachyglottis (23spp.).	3430 accessions. 967 spp and 256cvs.	Yes, electronic. Full species list provided.	Outlined in 1993 Management Plan.	Disease in some collections such as Olearia.
Oratia Native Plant Nursery, West Auckland	1975	Plant production, Conservation	Range varies depending on availability of material.	Over 650 spp. and cvs.	Yes	No	
Pukeiti Rhododendron Trust, Taranaki	1951	Amenity value (back drop to rhododendron collection). Conservation	Threatened species, Sub Antarctic	Not known at this stage	Yes	No	Lack of funding
Timaru Botanic Gardens, Timaru	1981	Educational, conservation	Association beds, Flax bed, grasses, South Canterbury collection, Fernery, endangered species.	About 650 accessions. 84 threatened species	Yes, electronic. Full species list provided.		
Percy's Reserve, Lower Hutt	1988	• **Conservation** – DOC Recovery programmes • **Research** – Material supplied to researchers • **Education** – Polytechnic course based here.	Accessions include Hebes (251), Coprosma (63), Olearia (71), Celmisia (103), Carex (111), Brachyglottis (50). Includes Tony Druce plant collection. Contains no cultivars.	2300 accessions	Yes, electronic	No. Performance criteria in Contract with the Hutt City Council.	New road alignment may reduce reserve area.
Arnold Dench, Newlands, Wellington	1966	Conservation and threatened species. Growing a wide variety of natives in a small section.	Lianes and trailing plants. Ferns, orchids, grasses, rushes, Hebes (80spp. 80cvs.). Celmisia (20spp.), Myosotis (20spp. 6 hybrids), Carex(36spp.), Uncinia (15spp.), Leptinella (19spp.).		Yes	No	Private collection in small suburban garden
Grant Bawden, Christchurch	1989	Show the range of alpine plants suitable for show purposes, both species and hybrids.	Aciphylla (12 spp.), Raoulia (19spp.), intergeneric hybrids.	<150 accessions	Yes. Full species list provided.	No	
Peter Nicol and Evan Hooper, Wairarapa	1988	Plant production and conservation		500 - 600spp.			
Joanne Orwin, Christchurch	1970	alpine plants		100+ spp.			
Graeme McArthur, Lothlorien Nursery, Canterbury		Greater use of natives especially those not well known. Threatened species.		250 spp.70 forms and cvs.		No. Plants will be passed to another charitable trust	

TABLE 2: OVERSEAS NEW ZEALAND PLANT COLLECTIONS

Collection	Established	Objectives	Major plant groups	accessions	records	collection policy	Threats
Royal Botanic Gardens Kew, England	1800	Research, horticultural display.	**Hebe**	292 accessions representing 146 taxa	Yes	No	
Edinburgh Botanic Garden, Scotland	100 + yrs	Research (Apiaiceae), Education	Celmisia (30spp.), Aciphylla (15spp.), Raoulia (9spp. & hybrids)	391 spp.	Yes	Yes	
University of Bristol BG, England	1980	Landscape values, education, research	Rock garden plants. Hebe (58 spp. 81cvs.), Cordyline (5spp.).	About 200 spp. and cvs.	Yes. Full species list provided.		
Strybing Arboretum, San Franscisco, USA	1915	Education focusing on ethnobotany Plants in Californian Horticulture.		About 200 spp. and cvs.	Yes. Full species list provided.	No	Major new developments following devastating hurricane several years ago.
Royal Botanic Gardens, Sydney, Australia		Education, Research and Recreation	Range of plantings at the main Garden in Sydney, with more thematic plantings at Mount Tomah. Future plans for a Gondwana type collection at Mt Tomah.	925 accessions representing 454 taxa.	Yes, electronic. Full species list provided.	Being reviewed.	
Inverewe Gardens, Scotland		NCCPG National Collection of Olearia	Olearia 46 spp & cvs (Aust as well)				
Mount Stewart Gardens, Northern Ireland		NCCPG National Collection of Phormium	Phormium (40cvs.)				
Ventnor Botanic Garden, Isle of Wight, England		NCCPG National Collection of Pseudopanax	Pseudopanax 15 spp. & 9cvs.				Many plants in the collection stolen several years ago. Collection being re established following donation of seed from New Zealand.
Fingal County Council, Dublin, Southern Ireland		NCCPG National Collection of Olearia	Olearia 39spp. & 9cvs.				
Bicton College of Agriculture, Devon, England		NCCPG National Collection of Pittosporum	Pittosporum 70 spp. And cvs.				
G Hutchins, County Park Nursery, Essex, England		NCCPG National Collections of Parahebe and Coprosma	Parahebe 11 spp, 17cvs. Coprosma 26spp. & 50cvs.				
M Searle, Guernsey		NCCPG National Collection of Hebe	Hebe 130 cvs.				
Siskin Plants, East Anglia, England		NCCPG National Collection of Hebe	Hebe 32 spp. & 53 cvs.				
N Hutchinson, Yorkshire, England		NCCPG National Collection of Hebe	Hebe 200 spp. & cvs.				

TABLE 2: FURTHER COLLECTIONS NOT YET ASSESSED

Chelsea Physic Garden, London,England
The National Botanic Gardens of Arts, Culture and the Gaelacht, Dublin, Ireland
Tresco Abbey Gardens, Tresco, Isles of Scilly, England
Ulster Museum Botanic Garden, Belfast Northern Ireland.
John Matthews, 33 Sutton Road, New Plymouth
Chris and Brian Rance, Invercargill
John Donald Glendonald, RD 16 Fairlie
Steve Newall, Dunedin
Dr Josephine Ward, Canterbury University

in 1926. Cockayne's vision for Otari was published in 1932 (Cockayne 1932). Cockayne directed the philosophy and development of Otari and laid down four major objective for the reserve:

1. **The flora**. A collection shall be made of all the New Zealand species possible to cultivate in the Museum. The species will be arranged as far as possible according to their families.
2. **The Vegetation**. Examples shall be artificially produced of various types of the primitive vegetation of New Zealand, for instance kauri forest, southern beech forest.
3. **Restoration of the forest**. The forest of them Museum shall be brought back as far as possible to its original form....
4. **Horticulture**. The use of indigenous plants for hor ticultural purposes shall be illustrated in various ways....

Otari became New Zealand's foremost plant collection and the only botanic garden devoted exclusively to native plants. Over the past 70 years of development, Otari has developed a world class reputation and built up a major collection of native plants. Today it contains about 1200 species and cultivars, represented by about 4000 accessions. Major influences on the development of Otari and its plant collections include Walter Brockie who came from the Christchurch Botanic Garden in 1948. He established the rock garden and travelled throughout New Zealand and its off shore islands in the 1950's collecting plants. Raymond Mole became Curator in 1963, and he developed the horticultural role of Otari and selected many plants with horticultural potential. During his time the Wahine storm opened up areas of forest which he developed into the present day Fernery, Wild Garden and Dracophyllum Garden.

More recently a major redevelopment of Otari and it collections fronting Wilton Road has seen the establishment of a major alpine garden planted in ecological associations complete with mountain tarn and boglands. This development, developed under the guidance of assistant curator Anita Benbrook reflects the modern day focus of botanic gardens on natural habitats and associations of plants.

Survey of Native Plant Collections

In 1999, the author undertook a survey of New Zealand plants being grown in major public and private gardens, both in New Zealand and overseas. This first survey was based on the authors' personal knowledge of native plant collections, and historical records showing which overseas gardens had received major shipments of plants and/or seed in the past. Sixteen New Zealand and thirteen overseas collections were sent survey forms. The questions were:

A SURVEY OF NEW ZEALAND NATIVE PLANT COLLECTIONS

1) Please list your major collections of New Zealand plants and give the following details:

- *i) Size and composition of each collection. For in stance: Hebe collection comprising 45 species and 92 cultivars.*
- *ii) Objectives of the collection. Is it for educational, conservation, and /or research purposes?. Please describe in detail.*
- *iii) Does each collection have a formal policy? If so could you please include a copy here?*
- *iv) How do you collect plant material for the collec tion?*
- *v) Do you keep records of the collection? Are these kept manually or electronically?*

2) How long have you been collecting New Zealand plants? Do you see this collection as increasing in size and importance in the future?

3) Are your New Zealand collections under any type of threat?, for instance lack of funding, lack of skills

to look after them , property being sold and so on.

4) Please provide any other information about your collections that may be of interest.

Survey forms were returned to the author by 31st July 1999. Only one garden did not reply to the survey. In addition, another 9 collection were identified by recipients of the survey. These are listed in table 3 but have not been contacted for information at the time of writing this paper.

Main results of the survey

There are a wide range of native plants in cultivation. Whilst an assessment was not carried out of the total number of NZ species in cultivation a wide range of plant material is being grown including many uncommon and threatened species. Many collections have multiple accessions of some species, increasing the value of these collections for research and/or conservation purposes.

Collections within New Zealand understandably had the most comprehensive collections of naturally occurring taxa. Conversely many overseas collection had very comprehensive collections of cultivars. This perhaps reflects the major focus in the UK in particular, on cultivated plants and the development of garden forms. It also reflects the increased awareness of the need to conserve historic cultivars. Several of the UK collections were national collections managed under the auspices of the National Council for the Conservation of Plants and Gardens (NCCPG). It is of concern in New Zealand that no collections surveyed mentioned they were specifically collecting and/or conserving cultivars.

Important collections are in private hands

This survey reinforced the pattern in other surveys both here and overseas that many major plant collections are in private hands. These are often developed over many years by enthusiasts who build up a detailed knowledge of the plants they grow. However, the collections are vulnerable to loss or dispersement once the person passes away. The case of Tony Druce's collection that is now held by Percy's Reserve in Lower Hutt is a welcome exception to the rule with all of the collection remaining intact and professionally managed.

Integrity and objectives of collections

The vast majority of collections had comprehensive records and many were recorded on electronic database. Five of those surveyed submitted a listing of all extant taxa in their collections. Most also grew plants from wild sourced material.

Few gardens had specific and clear objectives for their collections and mentioned general educational and conservation goals without really defining what they meant or how they were going to be achieved. Some, however, like Christchurch Botanic Gardens had very clear, specific objectives. For instance the objective of the Rock Garden collection is to:

"Grow a wide range of New Zealand alpine, subalpine and montane plants, including those that are rare and endangered, with an emphasis on plants of the Canterbury Region"

Few described in detail how their collections contributed to conservation or research programmes. Edinburgh Botanic Garden was the only one that identified their collection of NZ Apiaceae were part of a research programme on the taxonomy of this family.

Few collections mentioned they had an ethnobotanical or economic focus and only Pukeiti mentioned they were working with local iwi. There would seem to be some major opportunities here that are not being exploited.

Co-ordination between collections

Collections in the UK are co-ordinated through the NCCPG collection scheme, which sets minimum standards for collections. In New Zealand there was no obvious co-ordination between collectors although many did mention they worked with each other and donated plants and seed to other gardens. Some gardens, such as Christchurch were focussing on regional collections, whilst several Wellington collections participated in a regional plant conservation network in association with the Department of Conservation. A similar scheme operated in Auckland.

A future role for plant collections: an integrated network.

There are advantages in developing greater integration and co-operation between the major native plant collections both here and overseas. This would enable us to broaden the genetic diversity of our plant collections and share responsibility for conservation amongst gardens. It would also enable greater clarity regarding the continued export of plant material at the time of the Convention on Biological Diversity

Benefits

- ❑ Conserve as wide a range as possible of our native germplasm amongst gardens and avoid overlaps. In particular heirloom collections of cultivars that are becoming lost to cultivation
- ❑ Provide official collections for use in selection, breeding, evaluation and introduction and taxonomic

study. This will, in some cases take pressure off wild populations with the increase in unauthorised collecting.

- ❑ Give gardens a much more focussed approach to developing their collections and the ability to concentrate on collecting specific genera and or species
- ❑ These collections will serve as reference centres for plant identification, cultivar registration, nomenclature and plant exploration.

How do we do it?

So where do we start and how do we carry out the work needed to make such a system work? Such collection schemes have been tried before and failed. The key is

- to keep such networks simple and have them regionally based at first.
- Develop national standards and policies. Such policies should be based on those currently operative in many botanic gardens and international conventions such as the Convention on Biological Diversity.
- Develop national collections for specific species and cultivars, particularly those that are not currently represented in collections. This will involve a further survey to identify the gaps.
- Work with iwi to identify issues and possible collections focussing on ethnobotanical/ cultural/economic themes.

Such an initiative is compatible with current initiatives such as the Gardens Association and regional plant conservation networks. The RNZIH is an ideal organisation to pick up and run with such an initiative. The time is right.

Paper presented at 'People, Plants & Conservation' Conference, October 1999.

Plant Conservation News

Mike Oates, Curator Manager
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It has been a big year for global plant conservation initiatives with two major events bringing plants and the need for their conservation to the forefront. The first took place in April on the island of Gran Canaria off the coast of Africa. Sixteen people representing organisations involved in plant conservation signed the **Gran Canaria Declaration** to press for a global strategy for plant conservation within the United Nations Convention on Biological Diversity. Signatories included Dr David Given from New Zealand, Chairman of the Plants Committee, IUCN Species Survival Commission and Manager International Centre for Plant Conservation at Lincoln University.

At the end of June another major event took place in Asheville, North Carolina. The World Botanic Gardens Congress attracted over 1000 delegates from 36 countries to discuss the future roles of botanic gardens in plant conservation and education. It was also the venue for the launch of the **International Agenda for Botanic Gardens in Conservation**, an action based document outlining priorities and targets for botanic gardens. I was privileged to attend the Congress and hear about initiatives first hand and talk with other garden managers about their programmes

The Gran Canaria Declaration

calling for a Global Program for Plant Conservation

Plants are universally recognized as a vital part of the world's natural heritage and an essential resource for the planet. They are a key component of global sustainability. In addition to the small number of crop plants we use for our basic food and fibres, many thousands of wild plants have great economic and cultural importance and potential, providing food, fuel, clothing and shelter for vast numbers of people throughout the world. Plants supply many important medicines, especially in developing countries where hundreds of millions depend on wild plants for their traditional health systems. The World Health Organization (WHO) has estimated that up to 80% of the world's people rely on plants for their primary health care. Finally, plants play a key role in maintaining the planet's basic environmental balance and ecosystem stability and provide an important component of the habitats for the world's animal life.

As many as two-thirds of the world's plant species are in danger of extinction in nature during the course of the 21st century, threatened by population growth, deforestation, habitat loss, destructive development, over consumption of resources, the spread of alien invasive species and agricultural expansion. Further loss of plant diversity is predicted through genetic erosion and narrowing of the genetic basis of many species. The disappearance of such vital and massive amounts of biodiversity provides one of the greatest challenges faced by the world community: to halt the destruction of the plant resources that are so essential for present and future needs.

Major efforts throughout the world are being undertaken by international agencies and national governments, supported by a great diversity of institutions, organizations and other groups at all levels to develop practical actions to safeguard plant diversity. Despite such efforts the number of plant species facing extinction continues to rise and a significant proportion of the genetic diversity of the world's estimated 300,000 vascular plant species is being lost

Recognizing the critical situation and their particular responsibility to alert the global community, the botanists of the world, convened at the XVl International Botanical Congress in St Louis, Missouri, U.S.A., in August, '999, attended by over 5,000 botanists from all parts of the world, noted in a resolution that as many as two-thirds of the world's plant species are in danger of extinction in nature during the course of the 21st century. They recognized that this threatens our expectation of using plant diversity to build sustainable, healthy and better lives for the future. The Congress called for plant conservation to be recognized as an outstanding global priority in biodiversity conservation.

Responding to the Congress resolution, an ad hoc group drawn from major international and national organizations, institutions and other bodies involved in biodiversity conservation from 14 countries came together in Gran Canaria, Spain on 3-4 April, 2000 to consider the need for a global initiative for plant conservation. The group resolved that a Global Strategy for Plant Conservation and associated programs for its implementation should be developed urgently, within the framework of the United Nations Convention on Biological Diversity. The aim of this strategic program would be to support and facilitate appropriate plant conservation initiatives at all levels, aimed at halting the current and continuing unacceptable loss of plant diversity.

Such a Strategy should develop effective mechanisms to enhance collaboration and networking, which will strengthen and support plant conservation locally, regionally, and internationally; to formally and informally

link different partners such as government ministries, institutions, NGOs, and local community initiatives. This Strategy should link existing efforts of the many significant international and national programmes that are already active in this area. It should draw on and extend the experience and resources of bodies already active in implementing global conservation programmes, such as the FAO Global Plan of Action for the Conservation and Sustainable use of Plant Genetic Resources for Food and Agriculture, supported by over 150 countries, the UNESCO Man and Biosphere program, DIVERSITAS, the Millennium Assessment of the World's Ecosystems, the International Agenda for Botanic Gardens in Conservation and the IUCN Species Survival Commission's Plants Programme. The Strategy should also be developed in full harmony with other initiatives currently under development, such as the global strategy on the sustainable conservation and use of forest genetic resources.

An element of this Strategy should be to integrate efforts in different disciplines (social, economic, and biological) towards plant conservation so that all appropriate and available resources, technologies, techniques and sectors are brought together in support of plant conservation. It should establish a means to gather and manage effectively the information required to support plant conservation actions, by means of a global electronic information system on plant diversity, its status, use and the threats it faces. This Strategy should also highlight the need for international programs in research and public education, to raise greater awareness of the importance of plants and the threats they face. The group agreed that such an initiative would require a coordination mechanism for information gathering, processing, and dissemination at appropriate levels, and particularly to support capacity building for plant conservation, especially in areas rich in plant diversity. Some major elements for a Global Strategy for Plant Conservation were agreed by the group and are outlined in an annex to this document

At the meeting in Gran Canaria, the group resolved to forward this document to the Conference of the Parties to the Convention on Biological Diversity, meeting in Nairobi, Kenya, in May 2000, to consider the development and subsequent implementation of a new global integrated plant conservation program, as an important component in achieving the objectives of the Convention.

Annex: The Elements of a Global Strategy for Plant Conservation

A Global Strategy for Plant Conservation should include and combine a range of different elements relating to conservation practice, social and economic factors, information, monitoring and research, education, capacity building and public awareness.

It must have well defined and achievable goals for integrated (ex situ and in situ) conservation of plant diversity, linked to targets for research, information management, public education and awareness to attain these goals. It should have a mechanism to monitor and coordinate its implementation and to link and maximise available resources for plant conservation.

The main elements of such a Strategy would be:

Integrated ex situ and in situ conservation:

- Set agreed levels and standards in plant diversity conservation and services worldwide to be achieved within a defined time name
- Give special attention to the conservation of the world's most important centres of plant diversity in cluding the ecosystems and the species they contain
- Support the maintenance of genetically diverse and accessible samples of the world's plant species in botanical collections throughout the world
- Pay special attention to the conservation of plant species of direct economic importance to human societies, especially crops and their wild relatives, forage plant species, agroforestry and forest species, medicinal plants and species used in other ways
- Control invasive alien plants and animals, which pose one of the greatest threats to plant diversity in natural habitats
- Develop and implement best practices in plant conservation which will ensure the fullest community and institutional participation at all levels
- Identify the underlying causes of plant diversity loss and assess the potential risks and constraints on its conservation, particularly in countries that are rich in plant diversity

Research, Monitoring, and information Management

- Undertake an ongoing international program of research on plant biology and interactions with social, cultural, and economic factors that impact biodiversity, so that the genetics and ecology of plants, both in the wild and in the context of human activities, can be well understood and utilised to support conservation action
- Document the plant diversity of the world, including up-to-date information on its distribution in the wild, its conservation status and trends, and its use and preservation in protected areas and ex situ col lections
- Develop an integrated, distributed, interactive information system to manage and make accessible information on plant diversity
- Monitor the status and trends in global plant diver-

sity and its conservation and produce regular reports

Social and Economic Benefits of Plant Diversity:
Products and Services -

- Identify and assess the socio-economic value and the cultural value both of particular species of plants and of plant diversity itself
- Identify and assess the existing and potential products and services provided by plant diversity
- Ensure that benefits derived from the use of plants are fairly and equitably shared
- Identify the underlying causes of plant diversity loss and assess the potential risks and constraints on its conservation, particularly in countries that are rich in plant diversity

Education and Public Awareness

- Articulate and consistently emphasize the benefits of conserving plant diversity, to raise awareness of the importance of plants and the threats they face, thereby encouraging active participation in their conservation
- Inform citizens and policy makers in every country about conservation priorities and policy options for plant species and their ecosystems
- Use relevant botanical institutions, such as botanic gardens, museums, colleges, universities and research centres in every country, as shop windows for plant conservation by demonstrating the interdependence of human beings and plants within all ecosystems
- Incorporate the importance of plants and plant conservation into formal and informal education.

Implementing the Strategy

- Within the context of the United Nations, develop a comprehensive world-wide multi institutional programme for conservation action
- Create a coordinating mechanism operating at vari ous levels to oversee and monitor the achievement of the Global Strategy for Plant Conservation and the implementation of the programme of plant con servation action
- Build the capacity of institutions and organizations worldwide to enhance their effective contributions and role in plant conservation

Link, integrate and support efforts undertaken by a diversity of organizations, institutions, communities at all levels for plant conservation

- Identify and apply existing and new resources for plant conservation

International Agenda for Botanic Gardens in Conservation

The World Botanic Gardens Congress was jointly organised by Botanic Gardens Conservation International (BGCI), the American Association of Botanical Gardens and Arboreta (AABGA) and the Center for Plant Conservation (CPC). Over five days a range of topics and issues were discussed with presentations from leading scientists, conservationists and botanic garden staff.

One of the highlights of the congress was a presentation by **Dr Cristian Samper**, Director General of the Alexander Humboldt Institute in Columbia who showed the relationship between local conservation initiatives and national and global strategies. He has been at the forefront of instituting the Convention of Biodiversity in Columbia whose political constitution now includes a national biodiversity policy. . Columbia now has 23 botanical gardens and 8.5% of its area is devoted to a national park system. He urged delegates to:

- ❑ Complete an inventory of the world's vascular plants
- ❑ Make this information available
- ❑ Strengthen protected areas
- ❑ Maintain ex situ collections both wild and cultivated, and
- ❑ Share biodiversity equitably amongst all people.

The International Agenda for Botanic Gardens in Conservation was launched by Dr Peter Wyse Jackson, Secretary General of BGCI during the Congress. The objectives of the Agenda are to:

1. Provide a common global framework for botanic policies, programmes, and priorities in biodiversity conservation
2. Define the role of botanic gardens in the development of global partnerships and alliances for biodiversity conservation
3. Stimulate the evaluation and development of conservation policies and practices in botanic gardens to enhance their effect and efficiency
4. Develop a means to monitor and record the actions undertaken by botanic gardens in conservation
5. Promote the roles of botanic gardens in conservation
6. Provide guidance for botanic gardens on contemporary issues in conservation.

The Agenda provides a framework for the world's 1800 botanic gardens to work together to conserve the world's flora and will be reviewed at the next congress in three years.

Copies of the Agenda are available from BGCI, Decanso House, 199 Kew road, Richmond, Surrey TW9 3BW, UK