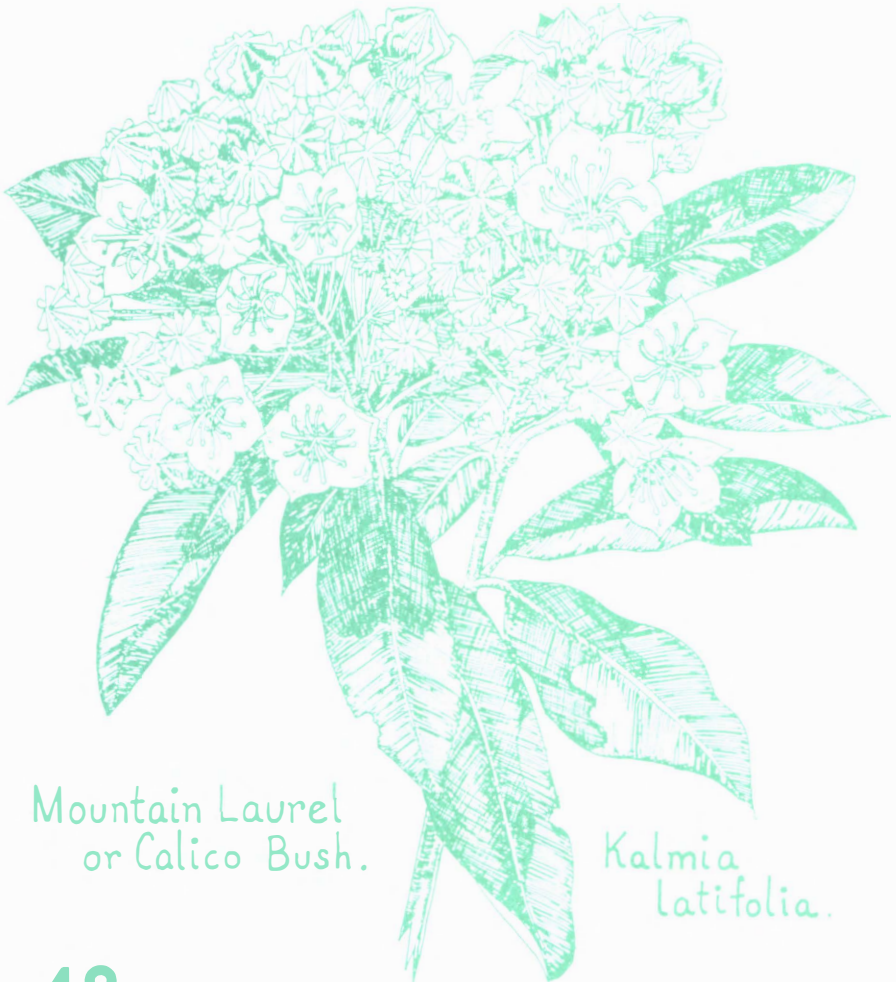
Horticulture

in New Zealand

Bulletin of the Royal New Zealand Institute of Horticulture (Inc.)



Mountain Laurel
or Calico Bush.

Kalmia
latifolia.

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HORTICULTURE IN NEW ZEALAND

Bulletin of the Royal N.Z. Institute of Horticulture
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FROM THE EXECUTIVE OFFICER

As most of you will be aware from Executive meeting minutes and other places, there are changes in the wind. And there's been plenty of wind up and down the country of late.

Subscription accounts have gone out and it is pleasing to note that at the time of writing (11 October), subscriptions are flowing in steadily. These include a considerable number of "Student Memberships", a new category of membership available to registered students for the first time in 1989.

The Government's long awaited "Hawke" Report on Post Compulsory Education and Training has been released, and in time this is bound to have an effect on the way the Examining Board conducts its system of national examinations. It is too early to say precisely what the effect will be, but we must be ready to respond to change.

This Bulletin will be the last to contain a separate "Student Section". As from the Autumn Bulletin next year contributions from students, and articles of interest to student members will be incorporated in the main body of the Bulletin. This means that Nick Owers who has compiled the Student Section and written the student editorial for many years now will no longer be prevailed upon to 'edit' a section of the Bulletin.

Nick, himself a longstanding RNZIH student, has worked hard and his contribution to the quarterly Bulletin has been much appreciated. I am sure that I speak on behalf of all our members in recording my thanks to Nick for his ongoing contributions over the years.

Here in the RNZIH Head Office, Enid, Vicki and I continue to keep as many facets of the Institute's operations as possible running smoothly. Sometimes it is a bit of a struggle, like right now with examinations fast approaching, but we are always open to suggestions as to how we might improve things for you folk - the members of the RNZIH.

I do hope all members have a relaxing and peaceful Christmas and return from their summer holidays fresh to take on the challenge of a new year.

Dave Cameron

DISTRICT COUNCIL PERSPECTIVES

Wellington District Council

The Wellington District Council Executive Committee draws its membership from people in parks and recreation, education, and self-employed and amateur gardeners. The length of service given to the committee is spread from new members to those with more than 10 years involvement. Membership is almost equally divided into three groups, those with up to 5 years on the committee, those with 5-10 years, and those with more than 10 years.

For the past three years the number of committee meetings has been reduced to four, plus the annual general meeting. We have been able to do this by setting up a number of sub-committees with responsibility for specific activities. These sub-committees meet as little or as often as they need to carry out their duties. They report back to the full committee with recommendations that are then discussed and amended if necessary, before being accepted by the committee. Sub-committees are set up for programmes, students, finance, awards, and policy.

"Managing Britain's Garden Heritage"

a public lecture by

JOHN SALES

Chief Gardens Adviser to the National Trust, UK

Wellington 21 November
New Plymouth 24 November
Auckland 28 November

The Barnett Memorial Lecture

"The principles of Conservation and Management of Historic Parks and Gardens"

Christchurch 23 November

Mr Sales, M.Hort (RHS) is responsible for advice on all aspects of the conservation, restoration, design and management of more than 100 National Trust gardens in England, Wales and Northern Ireland.

See your local paper or garden centre for details

with assistance from the British Council, NZ Historic Places Trust, Royal NZ Inst Horticulture

Our main concern is to provide a programme of events that caters to the range of age groups and interests in our membership. The programme includes field visits and evening meetings. Whenever possible we choose field visits to places that have a value for students. Our last visit was to a commercial glasshouse hydroponic production unit in the Wairarapa.

Our more successful evening meetings have been those when we have had an address given by someone visiting Wellington and when we have combined with another group with interests that parallel the subject of the address. We combined with the Wellington Botanical Society to hear a talk by Dr Charles Nelson. This was just before the AGM of the Institute in May. Other meetings have been with the Institute of Landscape Architects and the Historic Places Trust.

Two years ago, in response to the request to have an awards presentation for successful students, we began the Ian Galloway Memorial Lecture. This precedes the award presentation. The theme for the lecture is "Urban Horticulture". Two lectures have been given, one by Sir Michael Fowler and one by Mr Ian McCutcheon, respectively the Mayor and Town Clerk of Wellington when the late Ian Galloway was Director of Parks and Recreation. This has been our most successful recent innovation. We now intend to change direction and invite people with specific skills and knowledge in urban horticulture to give future lectures so that the event is one that appeals to a wide range of interest groups. The lecture has been an excellent event to precede the presentation of student awards. The occasion gives recognition to the achievements of the successful students and they have told us how much they appreciate being there to receive their award.

The District Council takes an interest in open space issues within the district. We have made submissions on the management plans for parks administered by the Regional and City Councils in our area. A small sub-committee is set up to prepare each submission. We have also appealed the removal of an open space designation from the old BNZ site by the Wellington City Council, and the lack of provision of open space by developers of office

A student visit to a Greytown orchard

tower blocks. Although we have not been successful in these appeals we believe that Council and the developers are more conscious of the need to provide adequate open space in areas of high rise development.

This year our District Council has moved into giving lectures for the public. We arranged with the Department of Continuing Education of Victoria University for three of our members to give a lecture on plant propagation with an emphasis on practical work. Two lectures were arranged, one in Wellington and one in Masterton, each with a limit of 24 enrolments. Enrolments at both lectures were easily filled. We are especially pleased that this is the case in Masterton. The lecture in Wellington was in May and proved to be a success. Those attending found the "hands-on" sections of the lecture were most useful. The arrangement with the Department of Continuing Education is an excellent one and we intend giving similar lectures next year. The lectures are also a good way of raising funds for our other District Council activities.

Each year the District Council organises a series of meetings aimed at helping students to pass the oral and practical examination. Other subjects are dealt with should the students request them. Field visits to commercial properties are arranged to show the students their operation and to demonstrate skills, such as pruning fruit trees. Practical sessions dealing with machinery, propagation methods, and greenhouse management are given on Saturday mornings.

Not all of the events and activities are well attended. Although most of them are arranged with the students in mind, it is the students who fail to turn up. We spent some time with students who had nearly completed their studies to find out what we might do that would interest students. From this we organised day trips to Mana Island to help with the work of revegetating the island and we found difficulty in finding the number needed to fill the boat.

This year even the student meetings have been poorly attended. Does this reflect the reduction of one oral and practical exam for amenity students? The District Council has begun an exercise to address the question, "What is our role in the future?" We hope the answer to this will provide us with the formula to increase our membership.

TAKE A JOURNEY TO THE CENTRE OF A TREE

Mike Oates previews the visit to New Zealand of Dr Alex Shigo, a world authority on tree biology and its application to tree care practices.

Alex Shigo began studying tree decay over 25 years ago when the United States Forest Service assigned him to a silviculture project in the White Mountain Forest in New Hampshire. His job was to help foresters deal with tree diseases. It didn't take him long to realise that disease was less of a problem than rot resulting from wounds made with logging equipment. Thus began many years of work which involved the dissecting of over 10,000 trees and the development of a new concept of how trees inhibit decay. Dr Shigo called the new concept CODIT, an acronym for Compartmentalisation of Decay in Trees. He found that trees defend themselves against invading organisms by creating a chemical shield around the wound. Organisms that penetrate the shield are blocked by the tree's interior barriers, chemically shielded compartments within each growth ring. Using this concept Dr Shigo came to the startling conclusion that many pruning methods commonly used were causing serious injury to trees. His task was then to convince tree experts, foresters and horticultur-

ists to change the way they cared for trees. This was to prove difficult, as Dr Shigo himself said:

"Everything I've done has had to be rejected about five times before it was accepted."

To get his message across, he wrote over 200 papers on his findings and made extensive lecture tours of the U.S.A., Canada, Europe and Australia. He has also published two books on his research, A New Tree Biology and A New Tree Biology Dictionary.

Dr Shigo retired from the U.S. Forest Service in 1986 and is now focusing his energy on tree education. He will be making his first visit to New Zealand early next year and will be giving three, one day seminars (18 and 19 January in Auckland and 30 January in Wellington) together with a three and a half day workshop in Auckland.

The seminars will include discussion on tree biology and practical tree care, and will look at trees and their problems in forests, parks and urban areas. They are aimed at helping the individual become a better arborist by increasing their knowledge of tree physiology and biology.

The workshop is limited to 20 participants and is designed to allow participants to touch and understand all parts of the living tree. Participants will use microscopes and other tools to study the structure of wood, bark, cambium and root tissue.

The seminars and workshop represent a unique opportunity for all those with an interest in trees to hear and talk to a world authority.

The cost of the one day seminars is $132.00 and the workshop $1,320.00. For further details of both, contact Helen or Ed Chignell of Treescape Ltd, Box 35-642, Auckland, telephone (09) 760-348.

LOOK TO THE NINETIES

R.N.Z.I.H. Annual General Meeting and Conference

To be held at the Otumoetai Trust Hotel, Bureta Road, Tauranga. May 19-20, 1989

Friday 19, 5.30 p.m.	Registration and Social Gathering	
	Dinner	
	Welcome, Presentation of Certificates and Diplomas and Speaker	
Saturday 20, 8.30 a.m.	Final Registration	
9.00 a.m.	A.G.M.	
	Workshops	Future of District Councils
		Botanical Gardens and Records of Plants
		Speaker on 'Rare and Endangered Plant Species'
6.00 p.m.	Presentation of Awards	
	Banks Lecture by Dr. B. R. Cook	
	Conference Dinner	

Sunday 21, 9.00 a.m.	Seminars	Fruit and Vegetable Judging Garden History with bus tour featuring Notable Trees and Garden History in Tauranga
Afternoon	Planning flexible until definite numbers available, bearing in mind the air timetables in and out of Tauranga. Possibly visits to the Te Puna area.	
Evening	Informal	

To enable definite planning, please register now for accommodation, especially giving times of arrival and departure.

Full details and Registration in the next issue of the Bulletin.

REGISTRATION FORM

NAME .....

ADDRESS .....

Please register ..... person(s)

Accommodation	Hotel	____ Thurs	____ Fri	____ Sat	____ Sun
	Motel	____	____	____	____
	Private	____	____	____	____

Otumoetai Trust Hotel $72 single $78 double 20 rooms

Cobblestone Court Motel $65 single $75 double, $15 per extra person per unit. Meals extra at both places. The Motel is two minutes walk from the venue of the meetings.

Please return to, The Secretary

Bay of Plenty District Council, R.N.Z.I.H.,
12 Tilby Drive, Matua,
TAURANGA.

FLORA FESTIVAL 21-27 NOVEMBER 1988

The Floral Festival is a week of symposia, workshops and celebrations to mark the launching of the "Flora of New Zealand Vol. 4, Naturalized Pteridophytes, Gymnosperms, Dicotyledons", and the opening of the new Herbarium Wing at the Botany Division of D.S.I.R., Lincoln.

The new Flora, written by C. J. Webb, W. R. Sykes and P. J. Garnock-Jones treats 1470 naturalized species and 397 indigenous species in genera which have both native and natu-

ralized species. The launching of the book is at 3.30pm on Monday 21 November, in the Fitzgerald Room of the Canterbury Agriculture and Science Centre.

There are several workshops which will be of interest to Horticulturalists, including "Identification of Naturalized plants" on Friday 25 November at 1.30 pm.

The Weed and Wildflower show in the new wing of the Herbarium is open to the public on 26-27 November.

For further information on any of these events contact:

Dr P. J. Garnock-Jones,
Botany Division,
D.S.I.R.,
Private Bag,
Christchurch.

FROM THE DISTRICT COUNCILS

Marlborough

The Marlborough District Council has recently had its first birthday and this is a brief resume of its first year of activities.

At the inaugural meeting the 4 main objectives of the District Council were considered to be:

Notable Tree Registration Scheme
Amenity Horticulture
Commercial Horticulture — Advisory Research Areas
Education in Horticulture

The Tree Registration is progressing well with a number of trees in the Blenheim/Picton/Sounds having been, or in the process of registration.

Monthly meetings and outdoor activities have been organised. However one regret is the lack of involvement and enthusiasm by the younger people — those who are students or working in the horticultural field. After all, it is for these young folk the need was felt to be there to form the District Council. Someone has to carry on in the future and rid us of the 'Garden Club' image!

Guest speakers have included:

Dr Giddeon Blumenfold who is now involved in planting Olive trees in Blenheim, asking us to question where our never ending water supply comes from?

Paul Millen who is working with the Blenheim Borough Council in establishing plantings on the barren Wither Hills.

Two young women speaking on herbs, fruit drying and fruit leathers.

Mr Ron Flook who is well known in Landscape Design and is the Convenor of the National Executive of Notable Trees.

Members talked about their job situations, orchard management, Park management etc.

Outdoor activities have included Saturday demonstrations of Pruning, Budding and Grafting and these have successfully included public participation.

The Marlborough District Council is looking forward to its second year with the major challenge being to get more R.N.Z.I.H. members involved with the activities.

Canterbury

Canterbury District Council has had 2 successful events recently. The first was an Oral and Practical Day at the City Council's Linwood Nursery. This is the venue for the Oral and Practical exams. Examiners were asked along so that students could find out something of the sorts of questions that might be asked and to sort out any problems which they might have been having. This session has been run for several years and is popular with students. For those who don't work for the City Council it is reassuring to see the venue before the day of the exam.

An irrigation demonstration was set up in the Botanic Gardens near the new Information Centre. This was done in conjunction with FruitFed who set up display boards and tables with their products. They also set out pipes and demonstrated the various equipment they have especially all the different types of emitters, from drippers to pop-up lawn sprinklers.

The demonstration was held on a Saturday morning and attracted a good turn out. As well as people who had come along especially for the event, being just inside the gate, quite a few people who just happened to be visiting the gardens stopped for a look.

Wellington

Our A.G.M. was held in July. After the official business was completed we were able to sit back and listen to an address given by Winsome Shepherd and Walter Cook. Their topic was a history of the Botanic Gardens, Wellington. The address was illustrated with maps, photos, and slides.

In 1839 the Directors of the New Zealand Company gave instructions for the laying out of the town of Wellington. The plan included a botanic garden, but the garden didn't appear until 1869. Since then more land has been added to the reserve area around the original botanic garden.

The bush remnants are a very fragile example of the original bush that once covered the whole area. What is so exciting about an ugly group of pines on Druid Hill and Magpie Hill? Well, in 1869 thoughts were moving in the direction that some substitute timber source would be needed to replace the rapidly disappearing native bush. Conifer seed was imported from India, California and Kew Gardens. Some of the trees grown from this seed are still present. At this stage the gardens were still strictly a scientific reserve. However financial problems saw the garden handed over to the City Council. The nursery there produced many of the trees planted around Wellington. The soils and climate certainly have an effect on the plants grown, but the plantings of the 1800's had a wealth of variety of plants grown and a teaching garden where the soundshell is now, contained many interesting plants and new imports. Still, despite the change in emphasis in the gardens, they still provide a lot of pleasure to the people who take time to view them.

Travelling to Taranaki?

Any members travelling to Taranaki over the next few months and wishing to visit three of Taranaki's finest gardens should get a Taranaki Gardens Concession Ticket. The $10 concession ticket gives you entry to Tupare, Hollands and Pukeiti. They are available from the New Plymouth Information Office.

FLORA OF NEW ZEALAND NAME CHANGES

H. E. Connor & E. Edgar

There is nothing more likely to rouse some horticulturists to utter cries of anger and frustration than the subject of plant name changes. Whether you agree with the reasons for changing names however is another story and not one I want to discuss here. The fact is that over the years many plant names are changed and accepted by botanists and horticulturists. This handy little booklet documents the name changes that have occurred in our native flora since the publication of Flora of New Zealand Volume 1 (1961) and Volume 2 (1970). It is primarily a scientific publication which documents the changes, and where new treatments differ substantially from those in Floras 1 and 2, full details of the reasons for the changes are given. For those of you who already possess copies of the Floras, this will prove to be an indispensable companion.

Copies are available for $11.00 (includes GST) from:

The Advisory Officer
Botany Division
D.S.I.R.
Private Bag
CHRISTCHURCH.

GENERAL SHOW JUDGING

The Institute includes in its activities training, registration and judging guidelines for general show judges. A schedule of Institute-registered judges is being compiled so that the Institute may respond to requests for general show judges and to allow liaison with judges over improvements to the judging guidelines "Flowers for Shows".

Would registered judges please advise B. Buchanan, 288B Manukau Road, Epsom, Auckland 1003 of your names and addresses and date of registration. I have a list of Auckland judges.

The Institute encourages registration to provide competent judges with a "ticket" and to promote standardised horticultural judging. People with at least five years experience in judging may apply for registration on a form available from the Executive Officer, Mr D. Cameron. Since "Flowers for Shows" will not be reprinted until present stocks are exhausted it is planned to prepare an insert to update sections that need it and Auckland District Council has held a workshop of judges who have made recommendations. If other district councils or horticultural groups have comments on updating or improvements I would be very pleased to hear from you.

If anyone knows of other organisations which use experienced judges who may be interested in registering with the Institute I would appreciate a contact name and address.

Brian Buchanan

STUDENT VISITOR

A final year student at Kew Gardens, Miss Alison Bowles, is planning a study tour of New Zealand from January to May 1989. She hopes to collect ferns for the Fern Section at Kew. The Genera she would like are *Sticherus, Sticherea, Gleicheria, Cheilanthes,* and anything from Hymenophyllaceae in general. By arrangement with the Quarantine officer at Kew she will be able to send back live plant material not just spores.

If anyone could help Miss Bowles to locate any of these plants she would be most grateful. Her address is:

Miss Alison Bowles
7b Kings Road
Richmond
Surrey
Great Britain.

BULLETIN NO. 49 — AUTUMN 1989

Copy due in by 1st March 1989

This Issue of the Bulletin will have to go to the printers in the first week in March. All copy should reach me by March 1st at the latest. Timing is critical for this issue as it contains information for the A.G.M. which according to the constitution has to be in members' hands six weeks before the meeting.

If possible articles should be typed with double spacing. If you hand write articles could you double space them and only write on one side of the page.

R.N.Z.I.H PUBLICATIONS

Members are reminded of the various publications that the Institute has available. Don't miss out on these valuable items:

1. "FLOWERS FOR SHOWS"
   A "must" for everyone involved in flower shows, whether as a judge or exhibitor.
   Cost $10.00 plus GST.
   Quantity discounts available on request.

2. ANNUAL JOURNALS
   Journals 1, 3, 4, 6, 7, 8, 11 $5 each + $1 (p & p).
   Journal 14 $8 + $1 (p & p).
   Journal 15 sold out.
3. "HORTICULTURE: THE CAREER FOR YOU?"
   This very valuable book for people contemplating a career in horticulture has just been revised. Copies have been sent free of charge to all secondary schools in New Zealand. Further copies are available from the Executive Officer at $5.50 each (including GST and postage).

EDITORIAL

Another spring has passed — time certainly seems to fly — although this year the unusually mild, dry winter must have had plants unsure of what season it was, with earlier than normal flowering of some species being evident. The spring season brings out many colour variations in the garden and the beautifully coloured and scented lilac, *Syringa vulgaris* cultivars (family Oleaceae) flowers are a true indication of the season. It is interesting to note also colour variation in new vegetative growth of some plants, for example, the reddish tinged foliage of *Eucalyptus delegatensis* (Myrtaceae) as compared to the creamy green of *Hosta undulata* (Liliaceae).

Inflorescences of sunflower *Helianthus annuus*. Family: Compositae. Country of origin: North America. Method of propagation: Seed.

Inflorescence of banana *Musa acuminata*. Family: Musaceae. Country of origin: East Indies. Method of propagation: Division of suckers.

With the very dry winter affecting a lot of the country it seems a long, hot summer could be in the offing. One flower crop which can withstand drought conditions is the sunflower, *Helianthus annuus* (Compositae). This plant, a native of North America, produces spectacular yellow inflorescences at a height up to 2 metres in summer. The sunflower seed has several commercial uses including oil extraction, snack foods and bird seed.

As many of you will have read in the last bulletin, compulsory student membership of the Royal New Zealand Institute of Horticulture is to be abolished in 1989. Hence the Student

Section of the Bulletin will cease to exist as a separate entity, although articles of interest to student members will still be published.

Since becoming Student Editor in the Autumn 1984 Edition, I have enjoyed the challenge of preparing this section. Many thanks go to those who have contributed articles, the Institute's typists for their many hours of good work, and the printers for providing the final presentation. Finally, I hope you have enjoyed reading this section of the bulletin and have found it useful in your botanical career.

Kind regards for the future,
Nick Owers.

PRESERVING SUMMER FLOWERS

From Grounds Maintenance Fact Sheet, Cooperative Extension Service, University of Massachusetts

Summer is the time to begin preparing plant material for winter bouquets. There is a large variety of annual and perennial flowers that offer many possibilities for preserving the colour and beauty of summer while adding another dimension to your gardening pleasures.

The methods of preserving flowers fall into two categories: drying and water replacement. Virtually any flower can be preserved, and some species can be preserved in more ways than one.

Much of the success of preserving flowers depends upon the proper picking and preparation. Begin by cutting flowers at the peak of their freshness, just before they are fully developed. If using any of the drying methods, pick preferably on a dry day, after the dew has evaporated.

DRYING METHODS

The following are five methods for drying flowers:

Air Drying. Flowers which have a natural tendency to dry on their own are best for air drying. Cut stems of flowers as long as possible. Remove the foliage from the stems, and group them in small bunches. Tie the bunches tightly with string or secure with a rubber band. Most flowers can be hung in bunches *upside down* on hooks, a line, etc. in a cool, dry, dark place with good air circulation. Hanging upside down keeps the stems straight and helps preserve the shape of the flower. Some flowers are best dried *upright*; especially those with firm, upright stems and rounded flower clusters. However, the stems tend to settle with a slight curve.

Drying in Water. Flowers with exceptionally strong stems, such as yarrow (*Achillea* spp) and hydrangea, prefer to be dried gradually while the stems are in water. They should be picked when the flower is already just beginning to dry on the parent plant.

Drying in Desiccants. A desiccant is a substance which withdraws moisture. The most commonly used desiccants are crystals — borax, alum, sand and silica gel. Kitty litter is another substance which can be used as a desiccant. Flowers are buried in the desiccant and left in an airtight container until all their moisture has been withdrawn. Flowers dried this way can last for many years, but they are often very fragile. Colour retention is usually good

as long as the finished product is kept out of strong sunlight. This method is more suitable for more fragile blooms.

Choosing a desiccant is largely a matter of personal choice. However, one important consideration is that the size of the grain must be right for the type of flower. The petals must be supported by the medium, but they must not be crushed by its weight.

For drying flowers in a desiccant select a tin or plastic box that has an air-tight cover. Fill the container to a depth of two inches with the drying agent. Cut the stems of the flowers about five centimetres and insert blooms face up. Space them so they do not touch each other. Sprinkle mixture over the flowers until completely covered, gently working it up around them so it is in contact with all parts of each flower. Cover container, seal with masking or adhesive tape if necessary. Store in a warm, dry place where it can remain undisturbed. After a period of 1-3 weeks, remove flowers by pouring off mixture slowly until they are uncovered. Lift out gently. Blow away any particles that adhere or remove particles and dust with an artist's brush.

Drying in Hot Air. Flowers that are prone to lose their colour, such as dephinium or larkspur, are best dried quickly in hot air. Some possibilities for utilising this quick method include drying in a food dehydrator, kitchen oven, microwave oven or near a heat source, such as a radiator. In some cases, it is desirable to first place the flowers in a supportive material (silica gel, mixture of equal parts borax and corn meal or kitty litter). This protects flowers that wilt easily and allows them to dry in their natural form.

To dry flowers in an oven or food dehydrator, remove foliage and place flower heads in a brown paper bag or bury in a desiccant. Set the temperature at a very low setting, 100°-150°F. Check material frequently and remove flowers as soon as they feel dry and papery and the petals sound like tissue paper when gently touched. Depending on the type of flower, the process should be completed within a few hours. To dry in a microwave, place flowers between layers of paper towel or bury in a desiccant. This drying process should be completed within 1-5 minutes.

Pressing. Pressing is most suitable for fairly flat plant material. Thin, flat flowers with very fine tissue such as violets and daisies and many wild flowers can be pressed successfully. Use a flower press (layers of corrugated cardboard, blotting paper and a heavy weight) or a heavy book (phone book). Place flowers between the layers of blotting paper so that they do not touch or overlap each other. Leave press or book in a warm, dry place for at least 6 weeks. The time will depend on the temperature of the room and the material being pressed.

WATER REPLACEMENT METHOD

Glycerine. This method involves replacing the water in flowers with glycerine (a sweet, syrupy, colourless, odourless liquid). The advantages of using this method is that the material retains its suppleness and is more realistic looking. However, there are only a few species which will respond to this method.

The glycerine must be diluted — one part glycerine to two parts water. Place stems of flowers in about 10-15 centimetres of the solution and leave in a cool, dark, dry place until the material has completely changed colour. If left standing in the solution too long, however, it can become over saturated.

COMMERCIAL FIELD PROPAGATION BY BUDDING OF WOODY PERENNIAL PLANTS

by Philip Carson

This is part of Mr Carson's dissertation for the N.D.H.

Mr Carson started his horticultural career working in a retail nursery in Cambridge. From there he moved to Duncan and Davies where he specialised in the field production area. Budding is an important part of field production. Currently he is involved with planning work at the same nursery.

1. THE REASONS WHY THE METHOD OF PROPAGATION BY BUDDING IS PRACTISED—

a) ADVANTAGES

With field budding there is no high capital outlay for propagation facilities or the requirement for high technical expertise as required with indoor propagation where the complete environment is controlled.

Budding propagation is often the only successful method by which many clonal cultivars of woody perennial plants can be propagated commercially and from an economical point of view. Cultivars of many commercial fruit trees are produced this way, eg Apples, Peaches, Plums and also cultivars of many woody ornamentals, eg Acers, Gleditsia, Hamamelis.

Propagation by budding provides the opportunity to use various rootstocks to obtain certain benefits as follows-

i) To control the growth habit of the cultivar. Dwarfing rootstocks are often used for commercial fruit tree production - eg Malus MM106 for Apple trees and Quince *Cydonia oblonga* for European Pear trees.

ii) To tolerate different soil conditions - eg with Nashi Pears the rootstock *Pyrus pyrifolia* is used for light to medium soils and *Pyrus betulaefolia* is used for heavy soils.

iii) To resist soil borne pest and disease organisms - eg Grape cultivars are budded onto Phylloxera and nematode resistant rootstocks.

iv) To perpetrate virus free cultivars - eg the use of virus free rootstocks for roses.

v) To achieve better fruit quality - eg several Citrus Lemon cultivars produce better quality fruit on Sweet Orange rootstock than they do on *Poncirus trifoliata*.

vi) To achieve increased winter hardiness - eg the use of the decidous Citrus species *Poncirus trifoliata* can tolerate much lower temperatures than any of the evergreen species of Citrus rootstocks.

vii) To produce different plant habits - examples, bush roses can be budded on a 1 metre standard to produce a different type of plant for landscape use. Normally pendulous or prostrate plants such as *Acer palmatum* 'Dissectum' cultivars and flowering Cherry cultivars can be budded on standards ranging in height from 60 cm to 2.5 metres to produce weeping specimens.

Budding propagation makes more economical use of propagating wood than grafting does, particularly if a new cultivar is being bulked up and material is scarce. Grafting scions usually have about 3 to 4 buds per scion whereas budding only uses a single bud to produce a plant.

Budding propagation is a method of producing selected male and female clones of di-

oecious plants - eg *Idesia polycarpa*. This enables a landscaper to plant several female trees for the ornamental berries and only one male tree. This compares to planting seedlings which may take several years to flower, with no guarantee as to whether they will be male or female at planting time.

b) DISADVANTAGES

Field budding propagation is subject to climatic factors which are usually beyond our control and which can greatly affect the success rate from one season to another, compared to other propagation methods which can be carried out indoors under controlled environmental conditions. A good example is the difficult to propagate *Acer palmatum* cultivars; in a good budding season the success rate can be as high as 80% while in a poor season when the success rate can be as low as 40%.

With budding propagation it is possible to produce commercial quantities of a single clone in which the genetical make up of each plant is exactly the same because it has originated from a single plant. Should a new pest or disease arise it could have catastrophic effects as every plant of that clone would have the same susceptibility to attack. A good example is some of the Poplar hybrids produced in New Zealand several years ago that were attacked by a new rust fungus that entered the country.

Budding propagation using different plant combinations can produce "varying degrees" of compatibility between the rootstock and budded cultivar. Sometimes incompatibility may not show up for 15 years or more as has happened with some fruit tree combinations. This long term incompatibility cannot be ascertained by the propagator and is usually only discovered over a period of time.

With the production of budded plants there are two propagation phases where there is a percentage loss at each stage. Namely the propagation of the rootstock by either seed or cutting and the propagation by budding of the clonal cultivar. If the percentage loss at each stage becomes too great the plant becomes less economical to produce.

2. ROOTSTOCK PRODUCTION

The two methods of rootstock production are sexual and asexual.

a) SEXUAL PROPAGATION

This is the propagation of rootstock by seed. This is usually the most economical and simple method of producing large quantities of rootstocks. Seedling rootstocks are best produced in the open ground, as against in containers, as they produce a better root structure for long term stability of the plants.

Seedling produced rootstocks have the disadvantage that genetic variation within the seedlings can produce variability in the growth and performance of the budded cultivar, this is particularly evident with *Acer palmatum* seedlings. This variability can be reduced if the seed is collected from selected mother plants which show the required characteristics (eg pest and disease resistance or vigorous growth habit), particularly if the mother plant is self pollinated and not cross pollinated with other inferior plants.

The time taken to produce a seedling rootstock suitable for budding varies with the plant species, eg an *Acer palmatum* seedling can take 2 years from germination to reach a buddable size, whereas a fast growing species such as *Robinia pseudoacacia* only takes about 5 months from germination to reach a buddable grade.

With seedling rootstock production, the grade of rootstock (which refers to both the plant height and stem calliper) that is planted is often fairly critical towards obtaining a rootstock of the correct size at budding time to give the highest possible budding propagation percentage. This means being very selective with rootstock selection which can result in a reasonable amount of wastage in the seed bed situation.

b) ASEXUAL PROPAGATION

The main methods used for producing rootstocks asexually are by cuttings or by stools. Cutting production can either be by softwood or hardwood method.

Many clonal rootstock cultivars have been developed over the years and are propagated vegetatively. They have been bred for various characteristics both for the rootstock and also for the resulting budded cultivars, eg *Prunus* 'Colt' is a Cherry rootstock which has been bred for ease of propagation as it is easily propagated by hardwood cuttings. It produces a rootstock of extremely uniform growth habit, ideal for commercial use. This rootstock has also simplified the propagation of flowering and fruiting Cherry cultivars. Within the group of flowering and fruiting Cherries there are many hybrids between various species. Before *Prunus* 'Colt' was developed the propagator had to use several different seedling rootstocks (namely *Prunus avium, P. serrulata, P. subhirtella, P. mahaleb*) depending on the hybrid and its parentage to avoid in compatibility problems. *Prunus* 'Colt' was bred and found to be compatible with all the various hybrids that are currently produced.

Another major characteristic of clonal rootstocks is those produced to give a dwarfing effect on the resulting budded cultivar. This characteristic is extensively used in the commercial fruit tree industry, eg Apple rootstocks - MM106 rootstock produces a semi dwarf tree growing to about two-thirds normal size. EM9 rootstock produces a very dwarf tree growing to one-third to half standard tree size.

Clonal Apple rootstocks have for many years been produced commercially from stools. This involves setting up a permanent stool bed which is started by planting a 1 year old rod and laying it horizontally along the ground and pegging it down. During the growing season all the vegetative buds along the rod shoot up growths vertically. As the growths lengthen the basal area is moulded up with either soil or a mulching material such as sawdust. This encourages the basal part of the stems to initiate root primordia. At the end of the growing season the mulching material is scraped away and the stems are cut off at the base. These rods with initiated roots are then planted directly in nursery row for budding that same growing season. A 95-100% rooting percentage is usually obtained.

BUDWOOD SELECTION AND HANDLING

The two seasons for budding are summer budding and spring budding for which different budwood materials are used.

i) **Summer Budding** — The majority of outdoor budding is carried out at this time. The budwood is selected from current season's growth using material on which the vegetative buds have fully matured which show as a well developed, plump looking bud. A good indication as to whether the budwood material is mature enough is to bend the leaf petiole sideways or downwards and if the petiole breaks away easily and cleanly this is a good indication that the bud is mature.

Budwood material is best collected in early morning when the plant material is the most turgid. The leaves are then removed by either cutting or breaking, as indicated above, leaving the base of the petiole attached to protect the bud during handling. The budwood should then be kept in a cool position, eg on the shady side of a hedge, until it is used. It can be either stored in moist sphagnum moss or alternatively the basal ends of the budsticks can be stood in a bucket with sufficient water to cover the base of the sticks. I prefer this method as the material is clean to handle. As a general rule, budwood is best used the day it is cut, however if it is necessary to hold it for a longer period it is best kept in cool store conditions around 7 to 8°C.

ii) **Spring Budding** — This is carried out in early spring at the commencement of growth of the rootstock using dormant budwood. The budwood for this operation is collected in mid-winter when the plants are completely dormant. Budsticks of the last season's growth

are collected and then dipped in a fungicide to prevent any fungus outbreaks during storage. The material is then placed in a plastic bag with a small amount of damp sphagnum moss in the bottom. The basal ends of the budsticks are placed in the sphagnum moss and the plastic bag is then sealed. This is best stored in cool store conditions, thus being stored in the dark and held at an air temperature of around 2°C and a relative humidity of approximately 85% to prevent desiccation of the material. The material should be checked about once every 3 to 4 weeks to make sure it has not deteriorated. The budwood is removed from the cool store conditions about 24 hours prior to use.

The budwood is usually collected from two main sources - either from permanent stock plants or from the nursery row crops. The budwood is most often from nursery row crops as it is younger and more vigorous and there is more material available thus enabling you to be more selective in the material you use. Whether budwood is taken from stock plants or nursery row crops it is very important that both sources are kept completely free of pests and diseases, thus a year round spray programme must be maintained. If the budwood source is infected with any fungal, bacterial, or viral disease, it is very easy to infect the rootstock with the budding operation and it may also affect the success of the budding operation.

COMPOSTING — MAKING SOIL IMPROVER FROM RUBBISH

Part two of a two part article

Methods of Making Compost
Three methods of making garden compost are available

Berkeley method

This is the best method. It arose out of research conducted at the University of California, Berkeley.

Published recipes state that alternate layers of high nitrogen and low nitrogen materials should be built up on top of one another into a heap about 1.5m high. Experience suggests that it doesn't matter much whether the materials are layered or mixed up before hand so long as the C/N ratio is near the optimum of 25 to 30. Some people find it simpler to mix the whole lot together as they make the heap. The minimum size of the heap depends on air temperature. Larger heaps are necessary in cooler conditions, otherwise too much heat is lost from the heap. So, as a general rule, aim at an initial heap volume of one or two cubic metres. Larger heaps may heat above 60°C killing the microbiological population. Sprinkle the ingredients with water as needed during making and at later stages if necessary. (You can get away with as little as half a cubic metre by covering a small heap with bags or some other insulating materials).

The heap is turned, mixed and aerated after three or four days and thereafter every two or three days until the fourteenth, when the compost should be ready for use, although perhaps a little coarse. Another week of composting will give a finer product. Care should be

taken to ensure that all materials spend some time in the hottest part of the heap, so that weed seeds and pathogens are destroyed. Frequent turning for adequate aeration is the secret of success with composting. The materials should be "fluffed-up" with a fork during turning to maximize aeration. Aeration can also be improved by building the heap on a platform made from loosely fitting wooden planks. Air will then penetrate the heap from the bottom as well as the sides.

Indore method

This is essentially the method devised by Sir Albert Howard. The name is that of the Indian state where he worked.

The Indore method involves minimum effort, but it takes a long time to produce a usable product. Alternate layers of low nitrogen and high nitrogen materials are heaped on top of one another to a height of about 1.5m. The heap should be about 2m square at the bottom, tapering to about 1.2m if it is free-standing. Of course if it is contained by boards, bricks or wire mesh it would have vertical sides. A foundation layer of brush, prunings or tree branches helps aeration. The heap is covered with a 5cm layer of compacted soil to deter flies and to prevent the escape of foul odours. If, through lack of sufficient materials at the one time, the heap has to be built over several weeks, each top layer should be covered with soil.

If the heap is turned, the first turning should be eight to ten days after making, and then again after a further thirty or forty days. The compost should be ready for use about a month later. The process takes a year if the heap is not turned at all.

The Indore compost heap can very rapidly become anaerobic and therefore does not usually generate sufficient heat to kill undesirable organisms and seeds. Its anaerobic nature can also generate foul odours, hence the need to encase the heap with soil, or to aerate it through turning.

Often, through lack of time and energy, home garden compost heaps tend to be more like the Indore heap than the Berkeley, but the more we tend towards the Berkeley type heap through frequent mixing, the more rapidly will finished compost, and weed and disease-free compost at that, be produced. Accumulating organic materials in a reasonably dry state should make it possible for a Berkeley type heap of adequate size to be made every month or so in the average home garden.

Compost bins

Bins are useful for people with small gardens and little space. They do an excellent job of composting kitchen scraps and moderate amounts of garden materials. Add soil or finished compost in small amounts from time to time to prevent "pugging" in sloppy kitchen wastes and to provide a full range of microbes. Some bins have holes in the bottom or lower sides to allow air in to keep the contents aerobic. Other bins are open at the bottom and are simply sat on the ground. Leaving a small air space under them will help the composting process. You can make your own bins from old drums.

Gardeners with larger requirements can purchase several bins but it is cheaper to make rough bins from railway sleepers, scrap timber, bricks (leave air spaces), wire netting or old galvanised iron, or to simply make heaps. Some gardeners find that both a bin and a larger scale heap are needed — one for kitchen scraps and the other for garden refuse.

An alternative to bins for those with enough space is to feed all food scraps to hens. Inedible materials are mixed by the hens with their excreta and the sawdust of the deep litter. From time to time some of the litter can be removed and incorporated into a compost heap that would otherwise be a bit low in nitrogen, phosphorus and potassium. This way we get a double return — eggs and recycled nutrients.

Earthworms

Earthworms eat large quantities of soil and organic materials; they are very effective in reducing the size of bulky litter and incorporating it into soils. They can also do this in compost heaps of the Indore type and so hasten the composting process. However, earthworms cannot survive the high temperatures produced in Berkeley-type heaps. If you want to add worms to such a heap, wait until after the temperature drops. But it seems that there is little need to add worms to this sort of heap. Microorganisms have already done the work that earthworms might otherwise have started. Getting the compost out onto the garden where earthworms can mix it into the soil where plant roots are seems to have greater merit.

Trouble shooting

There are four main reasons why compost heaps fail.

(a) They are too wet. The tell-tale sign of this is the production of foul odours. The problem may be overcome by adding dry materials (with due regard to C/N ratios) and/or by more frequent turning.

(b) They are too dry. The cause here will be obvious if the heap is dug into. Sprinkling with water during remaking is the cure.

(c) Carbon/nitrogen ratio too high. This problem is indicated if the heap "works" for a while and then slows down, even though the moisture content is satisfactory. There are no foul odours produced. The cure is to add high-nitrogen materials such as lawn clippings, animal manure (including dog faeces and human urine) — a nitrogenous fertilizer.

(d) Lack of other nutrients. Probably the only one likely to be limiting is phosphorus. Light sprinklings of rock phosphate, bone meal, superphosphate or other phosphatic materials can aid the composting process. Never add more than 2 per cent of the weight of the heap.

A caution

If you look inside a partly finished compost heap you will often notice that the organic materials have turned white or grey-white. This is because they are covered with thermophilic actinomycetes doing a good job of breaking them down. That's as it should be. But these microorganisms produce very large numbers of spores. If the compost heap dries out and is disturbed, clouds of these spores go into the air. The compost maker will find them rather irritating to breathe.

The compost maker's best protection is to make sure that materials being composted, and finished compost, are kept moist at all times so that spores do not fly into the air unnecessarily. This simple precaution ensures that composting is a very safe process, probably a lot safer than burning, with the breathing of smoke involved, and certainly safer than the smelly business of saving food scraps for weekly collection for dumping in large open dumps.

Using the product

We supply the right conditions; microorganisms do the rest for us. In the end they give us a pleasant smelling, dark, crumbly material that is at once soil conditioner, fertilizer and suppressor of soil-borne diseases of plants.

Compost may be used around mature plants as soon as the temperature of the heap has come down below 40°C — say three weeks after building the heap. Leaving it cure for a few more weeks will improve it by increasing its fineness and reducing the need of microorganisms in it for the nitrogen that we want our plants to have. Finished compost has an earthy smell, has few recognisable pieces of the original organic materials and is a fairly uniform dark brown or black colour. Rain can leach nutrients from finished compost, so cover finished heaps until they are used.

Sieved compost may be used as a top dressing for lawns. Otherwise it may be either dug into garden beds for vegetables or flowers, spread as a mulch around shrubs and trees (keeping 40 to 50 cm away from the trunks of fruit trees) or spread between rows of growing plants. Rain or sprinkler water will wash nutrients from compost mulches into the soil and plant roots will grow up into the lower layer.

It is sometimes stated that it is best not to dig compost into soils as this does not happen in natural situations such as forest floors. Digging it in amongst established plants is certainly undesirable as the digging might damage roots. But in vegetable beds, which are unnatural anyway, distributing the compost down through the soil will give plant roots quicker and more intimate contact with it than if it were just spread on the surface. Australian research has shown that considerable amounts of nitrogen can be lost from organic residues such as grass tops and animal dung lying on the surface of the soil; burying has been shown to reduce this loss and to boost plant growth. Also, by digging it in we partly copy the natural activity of earthworms, only we speed the process up to suit our crops.

Perhaps a useful compromise is to dig our compost into beds for annual crops so that the roots of these crops get maximum amounts of nutrients early in their growing period, but to add a further layer to the soil surface during the growing season as a mulch and extra supply of nutrients. For perennials, surface application is really the only option available.

The physical or soil conditioner effects of compost are perhaps more important than the fertilizer effects. Poor soil structure inhibits root growth and so reduces the ability of a plant to reach needed nutrients. Compost promotes the aggregation of soil particles so that structure is improved. Roots, and water can move through the soil more easily. In addition, the water holding capacity of the soil is increased, so plants are less prone to drought. Digging is easier. Other soil conditioner effects include an increased ability of the soil to absorb rapid changes in acidity and alkalinity and the neutralization of toxic substances such as organic toxins produced by some plants, and toxic metals.

Rates of application needed to improve the physical properties of soils vary from soil to soil. Sandy soils and very difficult-to-manage clay soils benefit from rates as high as 10 kg per square metre for the first few years of an improvement programme. Later maintenance applications could be around 3 kg per square metre. This latter rate would also supply a fair proportion of the nutrient elements needed by many plants once severe deficiencies have been corrected.

The fertilizer value of a compost is directly related to the quality of the organic materials used. Materials of low nutrient content give compost of low fertilizer value. Typical contents are 1.4 to 3.5% nitrogen, 0.3 to 1.0% phosphorus and 0.4 to 2.0% potassium with smaller amounts of other nutrients. Some composts are therefore relatively low in plant nutrients and good growth can only be achieved by supplementing them with manufactured fertilizers or animal manure. One advantage of compost is that the nutrients in it become slowly available throughout the growing season and so are less easily lost by leaching than are nutrients in soluble fertilizers. The effect is particularly beneficial for nitrogen, which can be readily lost as nitrate from applications of soluble fertilizers. Compost greatly reduces the rate of nitrate formation in soils and so reduces the contamination of groundwaters with nitrate. Another specific effect of compost is that organic acids released during microbial activity in it increase the availability of phosphorus to plants.

Along with other organic amendments such as green manures, compost reduces the levels of plant pathogens (bacteria and fungi) and parasitic nematodes in soils. It does this mainly by increasing the general level of biological activity in the soil, so that more fungal spores and other "resting" stages of these pathogens and parasites are destroyed than would otherwise have been the case.

Conclusion

Once upon a time most organic "wastes", including human excreta, were returned to farmland. In fact, until little more than a century ago, not much else was available, except for bones, and bird droppings (e.g. guano used by the Incas). For a while the pendulum swung very hard in the direction of near total reliance on manufactured fertilizers in many countries. More recently the pendulum has swung back a little towards greater appreciation of the advantages of returning organic materials to soils. Market gardeners use large quantities of manures from stables, piggeries and chicken houses, sewage sludges are dried and incorporated into fertilizer mixtures, effluents from sewage treatment works irrigate forests and farmlands, solid municipal wastes are composted and sold as soil conditioners, integrated methanol and fertilizer producing units are available for villages and farms, simple twin-toilet systems (one is used while the contents of the other is fermenting to compost) and composting toilets are used increasingly. Millions have learnt to conserve their "wastes".

Small beginnings perhaps, but at least a start towards a less wasteful use of the finite resources of our plantet. The Chinese, it seems, return at least 90 percent of their organic wastes to their soils. It is not beyond our capabilities to devise systems for doing the same in other political and cultural environments. The simple compost heap multiplied by millions is one step in that direction, a step that we can all take without waiting for "them" to do something about it.

STREET TREES IN AUCKLAND CITY

This is part of a dissertation for the N.D.H. written by Mr B. L. Toy who is the Central Parks Officer for the Auckland City Council. Currently Mr Toy has direct responsibility for the Central Parks District for street tree planting and maintenance and for the Greenprint Walkways throughout the city.

Auckland City is situated on a narrow isthmus between two harbours the Waitemata and the Manukau. The climate is mild with only occasional frosts in the winter. The average temperature in summer is 19.5°C and the average winter temperature is 11.5°C. Suburbs adjacent to the sea experience salt-laden winds.

The Auckland City Council maintains approximately 32,000 street trees in an area which extends from Pt. England in the East to Blockhouse Bay in the West, and from Downtown Central Auckland to Epsom in the South. Most of this area is fully developed in housing, commercial and recreational use and is serviced by sealed roads, and sealed or concrete footpaths with or without a grass berm. There is still some housing development in the Eastern Districts with new roading, and a large amount of redevelopment in the inner city business district and around the central city motorway links.

A large city such as Auckland composed of man made structures, is often harsh in form and structure. Chosen well, trees can complement man's work and soften and beautify the city landscape. They should be introduced to every suitable site. Parks throughout the city provide an opportunity for tree planting. However, Auckland is well established and there is very little land available for new reserves. It is the street that provides scope for planting, particularly in the central city. Here trees keep people in touch with nature in the otherwise high-speed, stressful rush of city life. Street trees can also form a green network linking

natural features of the city such as the coast, the volcanic cones, the parks, rivers and inlets.

Auckland is a growing city, with much development taking place. In the central business district the mixture of old and new buildings and the strong desire for individual identity in new building design seldom results in any sort of harmony. Similarly in new suburban development mixtures of house design and structure are disturbing to the eye. Buildings appear to compete with every conceivable form of design and building material. In these situations the street and the trees can provide the only unifying theme throughout and trees are of immeasurable value.

Street trees have existed in Auckland since the first were planted in the mid 1870's. Examples of this early planting are the European lime trees, *Tilia* x *europaea* and Lombardy poplars, *Populus nigra* 'Italica', still growing in Princes Street. In most early street plantings, European tree species were used. Further examples are London plane, *Platanus* x *hispanica* (Syn. *acerifolia*) English Elm, *Ulmus procera*, and common oak, *Quercus robur*. These trees are growing in avenues in the berms, footpaths and occasionally in the street.

Some of the plane trees were pollarded at a height of approximately six metres above road level until 1972. They have now been left to grow without annual pollarding.

In 1956 a street planting programme funded by the Parks Department was put into effect. Three or four streets a year were being planted in street verges throughout suburban Auckland by residents. They could choose the tree or shrub species, purchase a tree from the Parks Department, and the tree would be delivered for them to plant. A stake was also supplied. There are problems associated with this system. Planting and staking techniques were often of a low standard, and the unco-ordinated planting of a wide mixture of tree and shrub species in a street usually resulted in a poor overall appearance.

A further drive to plant street trees was initiated by the City Council in 1976. An extensive city-wide survey was carried out which established that there was room for 18,000 trees — many of these replacements of earlier plantings. Planting was programmed to take place over four years, and numbers of trees planted increased as the City Council nursery could meet demand, as follows:

1978	3,000 trees
1979	4,000 trees
1980	5,000 trees
1981	6,000 trees

From 1981 to the present time street tree planting has consisted of replacement and new planting of 2,500-3,000 trees per year.

Progressive planting through new housing areas in East Auckland are being carried out, as well as new planting for streets and malls in the inner city. Examples of these are Karangahape Road, Queen Street, Upper Queen Street motorway link and Swanson Street mall.

A comprehensive survey conducted in July, 1987 shows that there were at that date 31,635 trees in existence in Auckland's streets.

Administration and responsibility for planting and maintenance

Trees growing in footpaths, grass verges or traffic islands are in the area technically known as "street" or "road reserve". Therefore responsibility for them lies with the Works Department. The system operated by the Auckland City Council is as follows:

All enquiries concerning street trees, either written or verbal, are directed initially to the Works Department District Engineer. Matters to be discussed at a political level are referred to the Works Committee. The Parks & Recreation Department provides expert

arboricultural advice and skilled contract labour. All work on street trees is carried out by Parks Department staff. The work is funded by the Works Department.

This system of administration has advantages and disadvantages.

Advantages

(a) Parks Department staff are operating on funds that are under the control of the District Engineer. By handling initial enquiries he has early appreciation of costs to be charged to his accounts.

(b) The District Engineer can often advise on such matters as whether it is possible to plant a street or not, at the initial enquiry stage. He has ready access to information such as presence and position of underground services, road widths, traffic flows and visibility.

(c) Administration work such as letter writing, telephone work, canvassing of residents, reporting to committee is carried out by the Works Department, leaving the Parks staff free to concentrate on technical matters and to get on with the tree work.

Disadvantages

(a) Roading and underground services are valuable items that are costly to repair if damaged. Consideration of these factors could understandably cause an engineer to turn down requests from members of the public to plant trees in road reserves. However, with the correct choice of tree and planting method, damage to roads and services can be minimised. There will always need to be some compromise and risk taken in order to gain the aesthetic and physical benefits of having trees in the street.

(b) Matters requiring political consideration are referred to Works Committee and decisions are made based on reports compiled by the District Engineer. If there has not been adequate consultation with Parks staff decisions could be made and policies formulated that are difficult for the Parks staff to put into operation. It is important that there is a Parks Department representative at Works Committee meetings when tree matters are under consideration.

The advantages outweigh the disadvantages, which can be overcome. This system of administration is simple to understand and operate. The public are served efficiently and the image of Council enhanced.

The Street as an environment for trees

The immediate environment in which street trees grow is far removed from the natural habitat of the trees. There are often restrictions on all sides, as well as above and below the tree.

An understanding of these factors is necessary when choosing suitable tree species for a street.

Overhead Wires

One of the greatest costs incurred in the maintenance of street trees is that of pruning to clear power wires. With newly planted streets, correct choice of species can reduce this future maintenance. However, many cities already have large trees under wires so pruning is necessary. The Auckland Electric Power Board policy states that there must be 1.5m clearance between trees and power wires. Some discretion is exercised by Power Board Inspectors, but the clearance is necessary to protect the insulation on the wires from abrasion by branches, and to ensure children cannot climb the trees into the power wires.

Directional pruning to clear power wires can be difficult when there is a wide span of wires over the crowns of the trees and Council staff should negotiate with the Power

Supply Authority to determine that any further building, or addition to poles to carry extra wires, is carried out vertically, not horizontally.

The Auckland Electric Power Board is gradually installing underground power services and converting old pole systems to underground reticulation. This should be encouraged. It is of great advantage to a Council wishing to grow and maintain street trees.

The Road

Roads are used by buses and high canopy trucks. The height of these vehicles or their loads can be legally up to a maximum permissible height of 4.25m. The Auckland City Council Works Department takes the view that two vehicles of this height travelling in opposite directions must be able to pass each other without contacting tree branches. This allows some scope with pruning, and means every tree does not have to be crown lifted to a lower branch height of 4.25m — an impossible situation with many species.

Underground Services

Essential services laid underground are often situated under the footpath or in the grass berm. In residential areas where the number of services is relatively small, the policy of the A.C.C. Works Department is to go ahead and plant trees and hope there will be no interruption of services by tree roots. Any obvious services are of course avoided.

In areas such as shopping centres, where there is congestion of services, more care must be taken. In fact in some places there are so many services it is physically impossible to dig a hole. Before planting a check should be carried out with the respective service authorities who should have plans of services as installed. In Auckland the authorities are:

Gas Board	for gas pipes
Post Office	for telephone cables
A.E. Power Board	for power cables
Auck. City Council	for water reticulation, sewer lines, stormwater pipes, traffic signals, cables.

The A.C.C. Works Department Streets Design Office carries a drawing. It is a cross-section of underground services and a guide to how they should be installed in a new road or subdivision in the Auckland City Council area.

It must be noted that this must only be used as a rough guide. There is no substitute for "as built" plans, obtained from the relative authority.

Soil Conditions

The soil into which a street tree is planted is a factor which can influence the choice of species. During the process of forming roads existing topsoil is often removed or compacted heavily. It is often too costly to alter the soil in suburban residential areas, and in this case the trees have to cope with existing soil.

Redevelopment of suburban shopping areas and inner city sites usually incorporates street tree planting. Often very little soil at all exists beneath the footpaths. In this case the preferred approach is to install raised planter boxes or containers below ground level, with grates or grilles at footpath level. A tree grate allows a reasonable area for oxygen and water exchange to the root zone in a hard surface area.

A tree growing in such a planter is in effect growing in a container, and a special soil mix should be used.

Vehicle Crossings

To drive safely onto a road from a footpath vehicle crossing, a driver must have clear visibility to left and right. Most street trees are situated where they can obstruct vision if not pruned correctly or of a suitable species.

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HAMILTON.

WANGANUI
Ms P. McDonald,
31 Ikitara Road,
WANGANUI.

WELLINGTON
P.O. Box 11-379,
Manners St. WELLINGTON

WHANGAREI
Mr K. Young, FRIH
P.O. Box 1530,
WHANGAREI

RNZIH Notable Trees Committee — P.O. Box 11-379, WELLINGTON.
RNZIH Garden History Group — P.O. Box 11-379, WELLINGTON.

Cover drawing: Kalmia latifolia
by Mr C. I. McDowell.

The Mountain laurel, or calico bush is the state flower of Pennsylvania in Eastern North America. An evergreen shrub able to withstand intense winter cold it usually grows to two or three metres high in cultivation and up to seven metres in its natural habitat. Named *Kalmia latifolia* in honour of Peter Kalm, a Finnish pupil of Linnaeus who travelled in North America in the early 18th Century, it belongs to the Ericaceae family.

As the popular name suggests, the leaves resemble those of laurels, the lolly-pink saucer shaped flowers open in Spring are produced in umbellate terminal inflorescences. The buds resemble starry drops of pink icing and the ten anthers of the young flowers are tucked away in special pockets of the scalloped corolla. Their stretched filaments are released by insects in search of nectar; when touched, the stamens jerk up and the anthers are forced against the pollinators.

This shrub delights in an acid, loose peaty soil, and resents heavy clay soil or dry summer conditions over a prolonged period. The free draining volcanic soils of Taranaki are ideal and being a mountain plant it is accustomed to high rainfall. Top dress around the roots with leaf mould and a dressing of sulphur or sulphate of iron.

Little pruning is required, and like azaleas and rhododendrons thrip would be the only troublesome insect pest. A fiberous rooting system allows easy transplanting in the Autumn. Like its relative *Kalmia angustifolia* the sheep laurel, the foliage is poisonous to grazing animals.