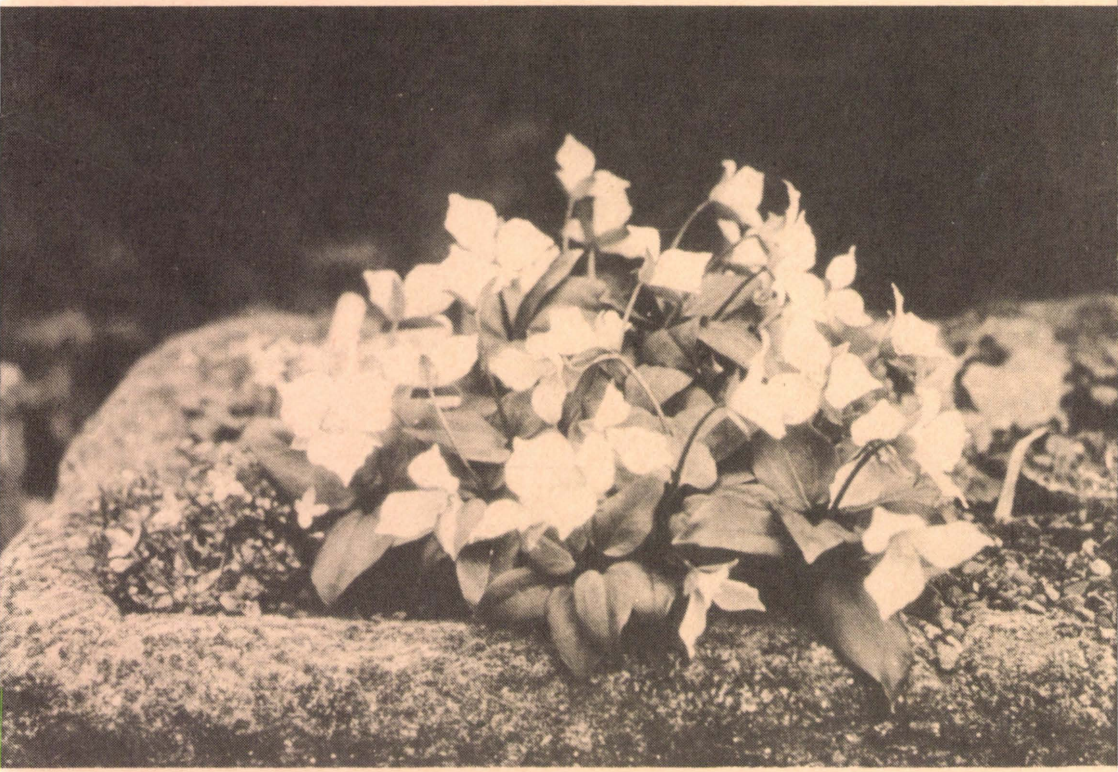
Horticulture

in New Zealand

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



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Spring 1984

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HORTICULTURE
IN NEW ZEALAND

BULLETIN OF THE ROYAL N.Z. INSTITUTE OF HORTICULTURE

NUMBER 33, SPRING 1984

Cover photo: *Trillium ovatum*

Registered at Post Office Headquarters, Wellington as a magazine.

EDITORIAL

Well it's Spring again and isn't it great to see the garden growing and all those plants you had forgotten about suddenly popping up and flowering - hopefully? I mean, I had forgotten about the clover, couch, dandelion, fathen, etc etc.

In this the 33rd issue of the Bulletin, I consider we have an excellent selection of articles. We have two rather long ones compared to our usual length, but both well worth reading. The first from the Q.E. II Trust outlining their work and the second on Biological Husbandries from a lecture given to the Clinical School of Medicine in Wellington.

A must for all who enter flower shows or are considering doing so - the new revised and reprinted "Flowers for Shows" booklet. For further details keep reading.

Another item of interest in this issue is the reprint of the cover photo from the Winter issue. We have identified some of the people in the photo but you will see there are one or two or three yet to have a name!! If anyone has any more information please write to me. It would be great to think that some time we could print a full list of names.

The best of luck to all students who are sitting exams and please take note of the comments in the student section.

Happy reading and warm weather with the possibility of a summer this year.

- David Shillito
Editor.

PLANT RAISER'S AWARD

Mr Felix Jury (72) of Tikorangi was awarded the prestigious Plant Raiser's Award for 1984. He was awarded it for his:-

Magnolia soulangeanas	'Iolanthe' and 'Serene'
Camellia	'Waterlily'
Rhododendron	'Felicity'
Phormium	'Yellow Wave'

In 30 years of raising plants as a hobby, Mr Jury has never been entered for an award before.

"Its nice to be recognised and to know other people enjoy what you have grown."

Farming is Mr Jury's business and his passion for horticulture will remain a hobby. His winning plants are destined to find their way into the propagation field. They will be patented and used in a Urenui nursery run by Mr Jury's son, Mark.

EDUCATION

THE WAIKATO TECHNICAL INSTITUTE'S

NEW HORTICULTURAL SCHOOL

From 'Hamilton Gardens' No. 4 June 1984

The horticultural section of the Waikato Technical Institute is comparatively new, the first courses being offered in 1980. The section has grown quickly since then to cater for an increasing demand from the industry.

Classes are presently conducted at the Waikato Technical Institute town site, and at a number of other locations within the Waikato. Theoretical knowledge is supplemented by a limited practical skills content, field trips and observation. However, for the student to gain maximum benefit in his/her training, the tasks involved need to be shown or taught in an appropriate setting such as a nursery, garden or orchard where the results of those skills and labours can be observed.

Educators recognise that students benefit from exposure to a number of training situations. Field trips, while allowing observation by their very nature preclude hands on experiences and hence limit the development of skills. Carrying out tasks in a laboratory/workship situation solely, similarly limits the scope of the student's learning. The provision of a facility such as a training nursery/orchard where such learning can be developed, is costly and expensive to maintain, and if developed alone may be too far divorced from commercial reality.

While Waikato Technical Institute horticultural programmes have included field trips and practical components as an integral part of the courses offer, an area where related skills can be developed has been lacking.

Teaching programmes to be developed at the horticultural centre in the Hamilton Gardens will now include the desired blend of field trips, workshop, laboratory, classroom and practical work input which has previously been lacking. While the extremely valuable extra facility of providing practical training will have been accomplished at minimum cost, the Waikato Technical Institute will be taking great care that its activities do not have any commercial or trading basis.

While part of the complex will be used predominantly by Waikato Technical Institute, community interest groups such as garden clubs, Horticultural societies, schools and community groups, are welcome and will be encouraged to use the facilities for meetings, seminars and workshops.

The Waikato Technical Institute hope to have their new teaching centre in operation for the beginning of the first term in February 1985. Plans have already been drawn up for the building and the surrounding site, and it looks as if it will be a very attractive facility indeed.

Apart from a hidden road to a staff carpark, the main access to the facility will be across a stone bridge from the existing Rose Garden's carpark. From the bridge one will be able to look down at a long pond filled with water lilies, irises and brightly coloured carp.

On crossing the bridge one will then enter a small court with broad steps providing a shallow ampitheatre.

Leading off the court will be a large teaching laboratory, a classroom and main entrance. Other rooms include offices for staff, storage rooms, a herbarium, locker rooms, lavatories and a cafeteria. This cafeteria opens out onto another court which in turn leads to a vine covered pergola and a deck overlooking the pond.

The main exhibition court will be located behind the horticultural school.

Related areas of the Gardens such as the Kitchen Garden, the practical area and the orchard will also need basic development to cater for the school's needs. These areas will also cater for other groups and general public use. The concept for them is explained in the "Hamilton Gardens Management Plan".

The new Horticultural School has important implications for the long term development of Hamilton Gardens. The Waikato Techncial Institute, Education Department and Council share an enthusiasm for a concept which is unique to New Zealand. Infact, it is believed that there are only two or three other places in the world with this type of facility.

Half the world is composed of people who have something to say and can't and the other half who have nothing to say and keep on saying it.

QUEEN ELIZABETH II NATIONAL TRUST

A GUARDIAN OF NEW ZEALAND OPEN SPACE

Protecting our Natural Heritage

The last issue of Horticulture in New Zealand described the Hollard Gardens in Taranaki which were given to the National Trust. Managing such gifts of private land is only one of the ways that the National Trust can protect parts of our natural heritage.

The National Trust was established by act of Parliament in 1977 to provide, enhance, and protect open space in New Zealand. This broad responsibility means that the Trust works with many people and organisations, ranging from private landowners to local and regional authorities and government departments.

Open space means all kinds of land and landscape features that are important scientifically, culturally, for recreation, or for their beauty or scenery. This includes wetlands, lakes, wild and scenic rivers, coastline, tussockland, wildlife habitats, rural landscape, forest, and forest remnants.

The Trust can help landowners protect some special feature of their land for future generations either through managing bequeathed or gifted property, or through open space covenants.

OPEN SPACE COVENANTS

An open space covenant is a legal agreement between the Trust and a landowner or leaseholder to protect privately owned land. This can be for a specified time or, more usually, forever.

The owner retains title to the land: it does not become the property of the State or the Trust. The covenant is registered against the title and binds the present and any subsequent owner to manage the areas in a specified way with the Trust as the permanent trustee. An open space covenant ensures that the land is kept as the present owner thinks it ought to be, even with change of ownership.

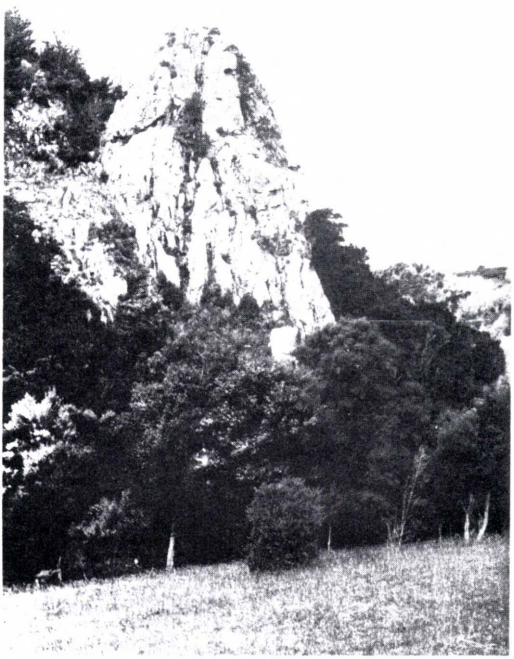
CO-ORDINATOR

The Trust Acts as a co-ordinator and helps with local or regional projects which no single group could implement on its own. Two examples are the Mt Karioi Landscape Study and the Nelson Open Space Proposals.

The Mt. Karioi Landscape Study carried out in 1980 on a tract of coastal landscape near Raglan is an example of a project in which the Trust was involved in both the planning and implementation. The purpose was to show how the landscape character could be retained and enhanced without inhibiting or unnecessarily compromising farm development (ie: to illustrate conservation and development).

The study co-ordinated the activities of several government agencies, the Raglan County Council, the recreational users, and the private landowners.

The Forest Service has carried out an extensive noxious animal control programme and fencing of the Forest Park boundary, the Department of Lands and Survey has rationalised and fenced reserve boundaries, the County has developed roadside pull-off areas and viewing ports, and most importantly several landowners have entered into open space convenants with the Trust to protect the important natural features on their properties.



A National Trust open space covenant protects a wetland, geological features, wildlife, and native forest on this privately owned farm in South Canterbury.

Open Space Proposals, Nelson

The Founders Society of Nelson invited the Trust to work with them on their pioneer village development. The village site is on reclaimed land, on the northern outskirts of the city alongside the motorway. The village is not the only proposed use for the reclamation. Neal Park, a recreational park, is already established and there are plans for a Marae, a residential subdivision and a golf course.

The Trust suggested a more comprehensive development, and prepared an open space concept which considers all the proposed uses and links them together and with the landscape beyond.

LANDSCAPE AWARENESS

On the belief that the more people know about their environment the more likely they are to be interested in protecting it, the Trust promotes landscape awareness among landowners. The Waipa County Landscape Project and Demonstration Farms are examples of this educational role.

The Waipa County Landscape Project started when the Waipa County Council approached the Trust for assistance with protecting the natural landscape features of the county. Key sites were identified and covenants were suggested to the owners. This, however, would not protect the other "ordinary" sites which are also important because of their contribution to the overall landscape. In order to protect these, the Trust developed a concept to encourage landowners to understand what makes the landscape and how individual shape it with their actions. As part of this the Trust is preparing a series of booklets aimed at the County residents. The first booklet is introductory. The second is about the vegetation and wildlife and was written by Dr Alan Edmonds, Reader in Biological Sciences at Waikato University and at present a visiting scientist with the Trust. The booklets will be circulated to all ratepayers in the county.

Ultimately, it is the people working on and with the land who shape it by their actions, but at present there are few sources of information to guide landowners. The booklets are intended to help fill this need.

The purpose of the Demonstration farms is to show the farming community how farm management and landscape planning and design can be combined to enhance long term production. So far, four demonstration farms have been set up. Each is a different type of farm in a different kind of landscape. The Trust will publish a booklet illustrating and describing each of them, and also organise field days on the properties.

Two of the Farms are privately owned, the third is the Lincoln College cropping farm, and the fourth is the Ministry of Agriculture and Fisheries research farm at Whatawhata in the Waikato.

The National Trust's Mount Karioi Landscape Study was carried out in close co-operation with the Raglan County Council. Its purpose was to show how the landscape character could be enhanced without inhibiting or unnecessarily compromising farm development.

EDUCATION

The Trust is involved with formal education about its aim and work. Three examples are the Revegetation Manual, the Wellington College Project, and the School-Covenant Programme.

The Revegetation Manual may be of particular interest to members of the Royal New Zealand Institute of Horticulture, for it is a practical guide to re-establishing or improving forest remnants. The Trust published it last year in response to an evident demand for such a publication from landowners and organisations and students. Revegetation is a straight forward way for people to protect and improve our environment and encourage interest in our indigenous plants.

The Revegetation Manual is in two parts:

Part One - Principles and Planning, covers background factors such as protection against fire and browsing animals, and the source of planting material. It also covers site selection and preparation, establishing a nurse crop, the choice of plants and plant propagation and planting. The section on management discusses mulching, fertilizer, and releasing.

Part Two - Revegetation on Specific Sites, covers planting in shrubland; the importance of specific native and exotic plants as nurse crops, eg: manuka, kanuka, tauhinu gorse, broom and bracken. It also covers various techniques for planting in grassland.

The reverted pasture and other rural areas, roadsides, waste and barren sites in towns and cities, urban parks and private gardens, all have tremendous potential for revegetation. We have already sold 3,500 copies of 5,000 copies printed.

The Wellington College Revegetation Project was prompted by the manual, which is going to be used as a textbook. The visually prominent hillside behind the college was originally part of the town belt.

Recently, the college's Board of Governors decided that most of this hillside should be returned to the city and reincorporated into the town belt, but with part of it kept for a revegetation project.

The project is to be carried out by the college's horticulture and biology students. It will have long term educational benefits, and it will be an educational resource for a wider community. Such revegetation, adjacent to the town belt, will contribute significantly to Wellington City.

The college applied for a 1983 Mobil Environmental Grant to finance the project and received the $2,000 Premier Award. The Trust has offered advice and technical assistance on the project.

SCHOOL/COVENANT PROGRAMME

The Trust has started a pilot School/Covenant Programme, which links schools with nearby areas protected by open space covenants.

Unlike much publicly owned protected land, many covenanted areas are close to schools. The idea of the programme is to give school contact with open space in their local area, for their education, recreation, and enjoyment. While ideally the programme would include urban schools, in this early stage it is likely to involve mainly rural schools because our covenants to date are all in the country.

The programme has the following aims: for early primary school, enjoyment in visiting natural areas; for late primary school, enjoyment as well as observation and basic research; and for secondary school enjoyment and more advanced research. The results could well be valuable to the landowner and the Trust in managing the covenanted land.

Study subjects will be determined by the values of particular covenants for example: ecology, landscape, geography, history, plant and animal identification, specimen collection, seed and seedling collection and growing, noxious animal damage, forest canopy structures, and so on.

The programme will give covenantors the opportunity to share their covenanted land with the local children. It will also increase public awareness of the Trust and our objectives through contact with the student and teachers.

The Trust helps with the programme, but essentially it is run voluntarily by the schools and covenantors. Details are worked out individually. The owners may wish to be very involved, or hardly at all, for example only to the extent of being told when a school party wishes to visit.

Other things have to be settled, such as timing of visits, access and transport to the property, and involvement of the school with planting or track maintenance.

The main emphasis is on enjoying being in areas of open space.

The Manganui-a-te-ao river (River of the World) is a tributory of the Wanganui with headwaters on the West of Mount Ruapehu. It is the last major wild and scenic river in that area not used for hydro power. The Trust successfully applied to the National Water and Soil Conservation Authority for a water right. This sets the minimum flow of the river at 90% of the natural level until July 1987.

THE FUTURE

The National Trust can help indivduals and private landowners with advice and specific methods of protecting important landscape features such as wildlife habitats and indigenous plant communities. Individuals can also help the National Trust by becoming members, making donations, and encouraging others to protect and care for our country's open spaces.

The increasing interest in the Trust's work shows that it can have a far-reaching impact on the New Zealand landscape and the ability of people to enjoy an environment that is worth protecting.

Queen Elizabeth the Second National Trust,
P.O. Box 3341,
Wellington.

Telephone: 726-626

Sophora microphylia 'Dragons Gold'

by

Mrs B.A. Jury

Pukeawa Nurseries and Gardens, Waitara

A seed of this Kowhai was brought back to New Zealand by a member of the Wild Life Department who were visiting Stevens Island on a field trip about 20 years ago.

The seed was germinated and grown and in 1978 some cuttings were given to Joy Plants in Auckland. Mr Hatch propagated the plants in small numbers and named the Kowhai *Sophora micophylla* 'Dragons Gold'. He called it Dragons Gold as Stevens island is known as the Island of Dragons, because it is largely populated by Tuataras. He could imagine the Tuataras sitting under the Kowhais looking up at the bright gold flowers or 'guarding their gold'. I purchased a plant from Mr Hatch in 1979 and have been propagating from it ever since. Our five year old is growing as a very dense bush and stands at present at 1.8m. Being evergreen and producing masses of gold flowers during the winter makes it quite remarkable as far as *Sophora* go, and excellent value for winter colour. The forms that grow on the island are very prostrate in nature due to the harshness of the wind but the ones I have seen in cultivation have all been dense bushes perhaps due to the shelter aspect. The plant is extremely hardy and a must for all New Zealand native collectors. The leaf form is small and dense and most attractive on its own.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

FIRST ANNUAL MEETING OF THE

ROYAL NEW ZEALAND INSTITUTE OF HORTICULTURE

LOCATION: Dominion Farmers Institute building, Wellington. Head Office of the Department of Agriculture for over 50 years.

MEMBERS IN PHOTOGRAPH:

No. 1: - Mr T.C. Brash; President of the New Zealand Fruitgrowers Federation.

No. 5: - Professor T.H. Easterfield; (1866 - 1949), Former Professor of Chemistry at Victoria University College and a noteworthy early New Zealand Scientist.

No. 6: - Dr Leanard Cockayne; (1855 - 1934) President of Royal New Zealand Institute of Horticulture, 1924 - 25, noted New Zealand Botanist.

No. 10: - Dr Reakes; Director General of Agriculture before World War I.

No. 11: - Dr Charles Chilton; (1860-1927), Professor of Biology and Rector of the old Canterbury College.

No. 12: - Mr Donald Petrie; (1846 - 1925), A well known New Zealand Botanist, a friend and colleague of Dr Cockayne.

No. 15: - Mr J.A. Campbell; 2nd Director of the Horticulture Division of the Department of Agriculture which existed from 1892 - 1971.

No. 20: - Mr T. Goodwin; Assistant Director of the Horticulture Division of the Department of Agriculture, under Campbell.

NOTE: Dr Leanard Cockayne; 1984 is the 50th anniversary of Dr Cockayne's death on Sunday 8th July, 1934.

RETIREMENT OF SECRETARY

Due to unforseen health problems the retirement of our Secretary Mr N. Neeson has been accepted with regret.

Mr R.A. Foubister has temporarily returned to the office and the National Executive is happy to announce that a Mr David Cameron will take up the position as Secretary on 8th October, 1984. Mr Cameron, age 41 is moving to Christchurch from Waikato University for family reasons. He has had considerable experience in student examination timetabling and programing as well as general secretarial responsibilities. We look forward to a long and happy association with him.

WELCOME:
to the following new members

Baker K.M.	Christchurch	Bartlett B.W.	Dargaville
Blake D.S.	Auckland	Bodell A.	Palmerston North
Brothers Prof & Mrs	Auckland	Bunch R.J.	Waikanae
Burrows R.S.	Christchurch	Chilvers G.C.	Christchurch
Clarke B.S.	Hamilton	Clifford C.S.	Otaki
Coffin C.W.	Whakatane	Commins K.S.	Frankton
Crosby D.A.	Auckland	Cullen C.H.	Ngatea
Dewer M.	Auckland	Dickens A.K.	Auckland
Drinnan L.B.	Wellington	Edwards C.R.	Auckland
Garden Design Centre	New Plymouth	Gaskell S.J.	Tuakau
Gear I.	Hamilton	Hay S.K.	Palmerston North
Haynes M.L.	Auckland	Hood J.	Ohura
Jeffries S.E.	Havelock North	Jones G.D.	Rotorua
Laurie W.L.	Dargaville	Leane M.H.	Auckland
Lumsden R.H.	Auckland	McLaren R.R.	Northland
Mountier L.A.	Auckland	Muller J.W.	Auckland
Ogle D.J.	New Plymouth	Owen A.R.	Wellington
Rossiter M.A.	Hamilton	Smith Mr & Mrs L.	New Plymouth
Smith P.C.	Auckland	Spranger R.P.	Clevedon
Stephens D.	Wellington	Tidey D.A.	Wellington
Uhr J.R.	Christchurch	Valentine R.	Palmerston North
Walker W.D.	Auckland	Walker W.	Auckland
Wells B.R.	Auckland	Wilson D.J.	Tauranga
White R.	Ngaruawahia		

COASTAL PLANTING

by

Noel Lothian

(Retired Director, Botanic Gardens, Adelaide)

It was interesting to read Alan Fielding's article (Horticulture in New Zealand, 31, Autumn 1984) on trees and shrubs for coastal regions. Most certainly the general views stated regarding monoplanting are supported. It was unfortunate that climatic data were not given, or are we to assume that the list refers only to those areas in which *Metrosideros* thrives?

Coastal planting has been a subject which has interested me for a long time, but because the Australian coastline is several thousands of kilometers long-passing from cool temperate to temperate, monsoonal to almost equatorial tropics to desert, i.e. regions which have less than 100mm rainfall per year it is essential to be specific in defining the area under discussion.

Most of my work has been done with regard to the coastline of South Australia which varies in climate and rainfall factors probably more than any part of the coastline of New Zealand. Generally it can be stated that all our coastlines are swept with strong winds, the soil is in the main alkaline either from the rock formations or the sand dunes and rainfall if it falls, occurs during the period from April to October, is varied. But of equal importance is to collate the incidence of rain and its total with the evaporation rate registered in the area.

Starting with the South East coastline, which abuts Victoria, conditions are cool temperate (although heatwaves of over 38^{o}C may occur in the summer) and rainfall ranges up to 1250 mm per year with evaporation rate usually over 1350mm annually.

The central and Southern coastline varies from temperate to warm temperate (heatwaves can be more frequent and up to and over 40^{o}C), with a very varied rainfall, usually related to the adjoining land, but 800mm would be about average, with evaporation usually over 1700mm per year.

The Gulf and Western coastlines are very different and except for the Southern tip of Eyre Peninsular (which receives about 800 mm rainfall and evaporation 1700mm annually), most of these coastlines receive between 400-600mm with evaporation rates up to 2600mm annually. It can be seen that despite winter rainfall it is only in the milder and better watered regions that a moisture deficit will not be present even during the winter months.

Planting along South Australian coastlines is most difficult and great care must be taken in selecting the species for planting. Even so unless additional water can be given during the dry months the failure rate can be high. Another important factor is the plant's tolerance to salt laden winds and regardless of their drought tolerance unless the plant will survive that salt blasting success is rarely achieved.

Of the plants listed by Fielding and taking rainfall between 550-750mm the following are useful to us:-

Acacia longifolia
Araucaria heterophylla
Cordyline australia
Eucalyptus botryoides
Eucalyptus ficifolia
Lagunaria patersoni
Pittosporum sp, especially
P. crassifolium
Quercus ilex
Tamarix spp.

The results of our testing and observations produce a more extensive list, many of which should be of use in New Zealand, at least along coastlines within the temperate to warm temperate regions.

Acacia, cyclops, ligulata, retinoides, salicina, sophorae
Agave americana
Aloe spp.
Arctotis stoechadifolia (an excellent ground cover for coastal regions)
Artemisia abrotanum, absinthium
Arundo donax
Atriplex cinerea, halimus, nummularia
Buddleia madagascariensis
Calocephalus brownii
Casuarina glauca, stricta
Chrysanthemum frutescens
Cistus laurifolius
Coprosma repens
Correa alba, "speciosa" and *reflexa*
Cupressus macrocarpa
Duranta repens
Eremophila longifolia
Escallonia macrantha, rubra
Eucalyptus anceps, brachycalyx, cheorllolia, conglobata, cornuta, diversifolia,foecunda, gracilis, gomphocephala, incrassata, lansdowniana, megacornuta, rugosa, socialis
Euonymus japonicus
Hebe andersonii, buxifolia, elliptica, lobeloides, parviflora, speciosa
Hydrangea macrophylla (hortense)
Lavatera assurgentifolia
Leonotis leonorus
Leptospermum laevigatum
Melaleuca halmaturorum, pubescens
Muehlenbeckia adpressa

Myoporum insulare, the equivalent to your *M. laetum*
Nerium oleander
Nitraria schroberi
Olearia axillaris, avicennaefolia, paniculata
Phillyrea spp.
Pinus halepensis, pinaster, pinea
Pittosporum phylliraeoides
Rosmarinus officinalis
Salvia aurea
Schinus molle
Senecio compactus, greyi, perdicioides
Spartium junceum
Tecomaria capensis
Templetonia retusa
Viburnum tinus
Yucca filamentosa, glauca

Not all of the species listed are trees which is the main thrust of Fielding's notes. But we have found and no doubt this experience can be matched in New Zealand, that "nurse planting" is useful if not essential to protect the main plantings until they are established.

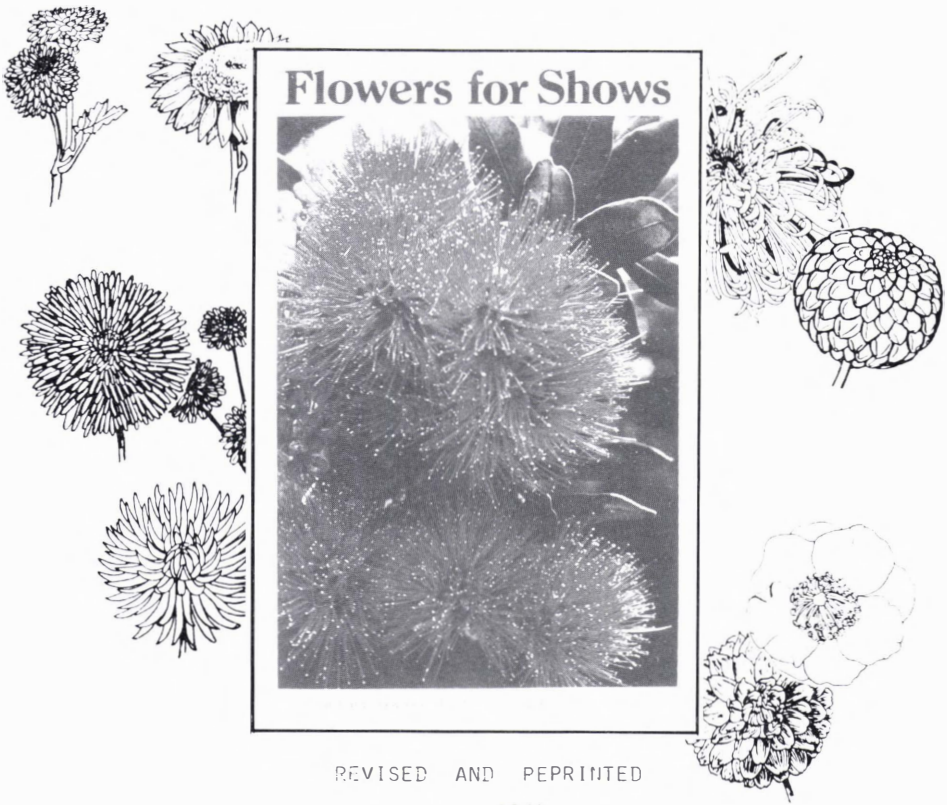
OBITUARY

Mr George Huthnance, one of Taranaki's best known nurseryman died recently at the age of 78.

Mr Huthnance was a Fellow Member of the Royal New Zealand Institute of Horticulture.

He gave freely of his horticultural knowledge and took an active part in the affairs of the Institute as well as being involved in many other horticultural groups, including the Camellia Society and Rhododendron Group. He began his nursery career in 1923 with the New Plymouth firm of Duncan and Davies. Mr Huthnance opened his own nursery in Timandra Street where he grew and sold garden plants and shrubs; later he moved to Carrington Road where he established his nursery and specialised in Rhododendrons.

FLOWERS FOR SHOWS BOOKLET



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JUNE 1984

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BIOLOGICAL HUSBANDRIES

by Robert Crowder, B.Sc. (Hons)

Senior Lecturer, Horticulture, Lincoln College

A lecture given on 18th July, 1984 in the Clinical School of Medicine, Wellington.

I have always been a naturalist and through my training and research have become a horticulturalist. But I regard myself still as a naturalist - an observer, because I don't believe that statistics and replicated trials are the only way to obtain great truths. My interest in biological husbandry was generated by the younger generation. Although I had been very much involved at Lincoln with intensive vegetable production for machine harvesting I eventually came to the conclusion that I was not really interested in depopulating the countryside, which is what seemed to be happening as a result of modern technology in vegetable production. This is true also of agriculture today and to many other aspects of rural development. Instead of being delightful and stimulating and an inspiring place to live the countryside becomes depleted and impoverished. So I started to think, in company with my students, that we were perhaps not teaching science - horticulture in particular - in the correct manner.

My initial casual interest in biological husbandry or organics as it was then called grew steadily and I found that a lot of students were deeply interested. With their help we collected a great amount of information and literature, much of it very scientific and in 1981 I went to see some of the places in other countries that were conducting research projects. I came back more convinced than ever that the world was in a really difficult situation and that the insidious pollution of the environment is a very much greater threat to the survival of the world than the nuclear holocaust. And I felt that perhaps New Zealand was a country that could set an example to the rest of the world on how an environment should function.

In 1980 the U.S.A. Department of Agriculture published their report and recommendations on organic farming. Many distinguished people were involved and they were impressed with organic farming. They recommended that research workers should investigate further how it was that farms not using the high energy inputs usual in American farming could succeed; and why these farmers did not want to use synthetic products. This report was soon followed

by one from the U.S. Council for Agricultural Science and Technology which compared organic and conventional farming. This report was not favourable towards biological husbandry but both reports are a valuable discussion of the issues involved and they showed that the movement was gaining in strength and creditibility.

So, in 1982, there was sufficient interest for N.Z. Federated Farmers to sponsor the first seminar on Biological Husbandry. As a result the MAF made a report on biological husbandry in New Zealand. Although the report was critical it showed that the movement in this country was big enough to attract the attention of government and pressure groups. The worst aspect of this report is a suggestion that conventional and biological farming are very similar and that N.Z. farming is already biological. However, research is continuing as the MAF monitor certain biological farms.

Is N.Z. a biological paradise? Lets look at the facts here and world wide. In 1983 over two million metric tons of active ingredient pesticides were applied - double that of ten years earlier. And this despite great progress in biological control of insect pests, integrated pest management techniques and electo-static spraying.

Crop losses in the western world due to insect pests have increased from 7% in 1945 to 13% in 1979, despite a ten-fold increase in insecticides used.

Chemical additives in food in U.K. in 1955 amounted to .6kg per person per year; in 1983 - 2.4kg.

Organo-phosphates and organo-chlorines are present in many N.Z. foods. The nitrate content of N.Z. vegetables varies widely. Australian tomatoes before export are submerged in a dimethide bath. (Dimethide is an organo-phosphate which by N.Z. regulations has a 14 day withholding period). A long-lasting poison, ethylene dibromide is used to fumigate fruit and vegetables coming into N.Z. from tropical countries infested with fruit fly. DDT is still used with a MAF permit on fruit and vegetables. 245-T is still sprayed indiscriminately over hillsides, rivers and roadsides. Thus our self image of a country following biological husbandry is dubious.

"We make practical applications of isolated factors without relating them to the totality of the living entity." Koepf, in 'Biodynamic Agriculture'. This is a very great truth that shows the limitations of the scientific community today as we go further into specialisation. Often research bears little relationship to the totality we are seeking.

My principles of biological husbandry are:

1. To work within a closed system. This closed system can be your garden, farm, district or country. But in the end it is the world that is your closed system. We try to recycle everything we use to the best advantage.

2. To maintain long-term fertility of the soil. Erosion is a very serious problem where ever it occurs. Soil is a precious heritage which takes a long time to create.

3. To avoid all forms of pollution that may result from agricultural pursuits. When we use high analysis fertilisers from Germany remember that those factories killed the Rhine and the Black Forest.

4. To produce foodstuffs of high nutritional quality. Organic produce has repeatedly been shown by careful long-term research to be superior to conventional produce. Organic vegetables will have less water and significantly higher content of vitamins, amino acids and minerals. Our aim is organic excellence. Inferior looking produce is not acceptable either.

5. To reduce energy inputs to a minimum. This means reducing the amount of tractor work, of manufactured fertilisers and of transporting them.

6. To give all livestock conditions of life that conform to their physical needs.

7. To make it possible for agricultural producers to earn a living through their work and to develop their potentialities as human beings.

To practice biological husbandry is not to return to a peasant existence. There is much technology utilisable today without exploitation or pollution of anihilation of animals.

Conventional land use in N.Z. today is too often a mono-culture, Dairying is a rye grass and clover mono-culture. Sheep farming is a mono-culture. Kiwifruit orchards are an unbalanced environment which encourages the proliferation of leaf rollers because it has no places for the predators of leaf roller.

To change to biological husbandry we have a break through a philosophical barrier. We change ourselves. From wanting to dominate nature and telling it where we want it to go we move to where we want to integrate with nature, work with it and let it do the work. In biological husbandry we find strength through diversity.

We shouldn't need National Parks. Our whole environment should be a delight. But today's farming methods make the countryside neither safe nor pleasant to roam in.

Our latest piece of research at Lincoln is to look at weed control in onion crops without weedicides or herbicides. Weed control is fundamental to the growing of this important export crop. We found that the use of an onion lifter working very shallow on a hot day is an effective way of killing weeds before sowing.

In N.Z. huge quantities of cereal straw are burned in the field. It could better be incorporated back into the soil as a wonderful, humidifying, soil-structure improver. Burning is also a vast waste of energy.

It is important that animal manure is composted properly to avoid the water table being polluted by nitrates. Composting also kills weed seeds. Farmers who want to move away from the use of synthetic manures and weedicides need access to the latest scientific research on how to move into a more biological approach with minimal depression of yield and minimal financial outlay.

Kelmarna Gardens in Herne Bay is well worth a visit. It is purely organic using the French intensive method. It is a most impressive and productive venture.

In 1977, at Lincoln we started with 2 hectare given over a biological husbandry. Gradually it grew and has become very popular with visitors. It is now 5 hectares. There is a meterological station as part of our holistic approach and students need to consider the incredible impact of the weather on the way things grow. Everything is mulched in winter to stop the frost getting into the soil. Then in the spring the mulch is pulled back and we plant or sow into the receptive soil When the plants are established we topdress with compost and replace with mulch.

Q. If you had a sandy situation would you use the same method?

A. Even more so.

Q. Do you get worms in sand?

A. Yes, if you get the humus content up. You don't need worms so much in sand because it is free-draining.
The principles we use are:

a. rotation of species
b. compost enrichment. We don't use anything else.
c. No sprays, biological or otherwise.

Q. Can you use this method on an undeveloped property still in grass?

A. If it is in grass it is excellent to do it this way. Put newspaper down, then compost and its ready for planting.

Q. Are fish remains and seaweed suitable for this sort of garden?

A. Yes, its superb.

Q. Do you develop a special blend of compost for each type of vegetable?

A. I don't believe that is necessary. Some plants such as brassicas are very hungry of nitrogen and require a more generous application of compost.

In our garden the Ph has steadily risen without the use of lime. Also all fertility levels have steadily risen.

All our debris - weeds and surplus crops go to flower before being composted. This planned diversity maintains a good balance of pest predators.

"A rich floral component on the orchard floor will pay rich dividends for control of pests in the orchard". The flowers attract the predators of leaf roller and codling moth. They need the nectar to become fertile. These predators then lay their eggs in the caterpillars and kill them. "Predators of insect pests suffer more from restricted habitat than the pests. Make sure refuge areas are available to nurture the predators to enhance natural biological control" Altieri, 1979.

Treat your predators like bees. In our orchard we plant the umbelliferous family - parsnips, carrots and dill and let them flower. They become a rich source of predator refuge. There are no leaf rollers or codling moths in our orchard.

We are experimenting with amaranthis, a grain from Mexico and Peru. It was the cereal of the Incas and Astecs. Amaranthis flour is high in lysine which is the amino acid missing from wheat and rice. Mix them and you have a perfect protein.

Our grassed areas which are mown for compost material contain a diversity of grasses, clovers and herbs. The soil is healthier and the compost richer.

Q. Do you introduce extra worms to your demonstration area?

A. No. There is no shortage of worms unless you have killed them with sprays. Also, putting worms into soil does not build fertility. As the fertility increases so the worms will come in greater numbers. Its very difficult to obtain earth worms. Compost or dung worms won't live in soil.

Q. What about the ink on the newspapers you use for minimum tillage garden?

A. Black is O.K. but avoid the coloured sections.

Q. Can fresh animal or poultry manure be put straight onto the garden?

A. It is very wasteful. Much of the goodness is lost into the atmosphere. All animal manure must be composted. This is likely to be a condition for a market garden wanting top grading for its organic produce.

Q. What about antibiotics and steroids in broiler house manure?

A. In tests in Europe it was found that antibiotics and steriods did not survive proper composting i.e. 60°C.

Q. How do you tell if your compost is ready?

A. If you can pick it up and crumble it without recognising the components then its ready.

Q. What is the future for N.Z.?

A. I would like to see N.Z. as an example to the rest of the world of a harmonious Garden of Eden. Of all countries, it has the greatest potential of ever achieving this because of our isolation and small population. We are very priviledged because we have three million people in a country the size of Japan or U.K. This is a tremendous asset but we squander it. I would like to see us become more self sufficient. I would like to see us revegetate the countryside in a well-balanced, biological way using a permaculture concept of utilising the plant and animal species available into our ecological situation. In N.Z. there is still time to make some relatively small modifications to change to a biological system. This would accomplish in totality what the beautiful N.Z. campaign has attempted - not just to beautify the roadsides but the whole. It will be beautiful because it is natural and harmonious. This is the possible scenario.

The only job where you start at the top is digging a hole.

Those who believe that where there is smoke there is fire have not tried cooking on a camping trip.

STUDENT SECTION

Rangiora

Brachyglottis repanda

Compositae

EDITORIAL

It is the season when plants awaken with foliar and floral buds bursting open showing a new abundance of life. The relatively mild winter, in this part of the country anyway has meant that this new life has begun quite early this year - an omen for a long growing season.

This time of year one sees a wide variety of colour as many herbaceous perennials, trees and shrubs herald in spring. Sap flow is synonymous with the increasing temperatures and lengthening daylight periods enabling more time to be spent in the garden.

Examination time is approaching again and study time will be increasing. In this issue are two articles referring to examination technique and these provide important information for students sitting exams. All the best for these.

I am pleased to report that some correspondence for this section has been submitted. Thanks for this, and may it continue. Also in this issue there is a 'Letter to the Editor' column. I would like this to become a regular feature of the bulletin and this, of course, depends entirely on you readers. So any news, views or questions - drop a line.

Kind regards
Nick Owers

Notes on *Carmichaelia appressa*

by

P.B. Heenan

N.D.H. Student

Prostrate broom, *Carmichaelia appressa* is a rare plant that occurs only on the gravelly sand of Kaitorete Spit and adjacent parts of Banks Peninsula, Canterbury. On Kaitorete Spit it grows in association with pingao or *Desmoschoenus spiralis*. Pingao was once widespread over much of coastal New Zealand, growing wherever active mobile sand dunes were being formed. However, today it is restricted to a few main localities, the Kaitorete Spit population being one of the largest. It has been eliminated from many areas by introduced plants such as marram grass and tree lupin, these stabilise the sand destroying the free moving habitat favoured by pingao.

On Kaitorete Spit both the prostrate broom and pingao are subject to unnatural pressures on their habitat. These include sand mining, stock grazing, introduced weeds, dune buggies and trail bike riding. Unless Kaitorete Spit is protected from these pressures future generations may loose this fine remnant of our once abundant sand dune system.

Professor Arnold Wall of Christchurch surmised in 1930 that *Carmichaelia appressa* "is the prostrate form of *C. subulata*" and "the extreme prostrate form is of course due to wind pressure.". However it was found that this plant is a distinct species and it was subsequently described by G. Simpson of Dunedin. Simpson rejected the theory of wind pressure causing it to be prostrate. He concluded that as the branches of plants point straight out in all directions the pressure must be vertically directed and not horizontal like wind pressure would be. In addition seedlings and cuttings in cultivation grow to maturity remaining prostrate. Allan in the Flora of New Zealand comments it is probably a habitat-modified form.

In early 1983 I observed this plant in flower on Kaitorete Spit. It was apparent that individual plants were highly variable in their flower production. So for horticultural purposes it would be desirable to cultivate the more floriferous forms. Though if it was necessary to cultivate *Carmichaelia appressa* as part of a conservation effort on its behalf representative samples of all forms would be required.

In cultivation *Carmichaelia appressa* is tolerable of dry soils but its growth responds to more moist and friable soils. It forms a flat mat if grown on the ground. I believe its greatest use could be as a weeper or trailer i.e. growing over walls or embankments. I have several plants growing over banks and rocks in this way.

Like most native brooms this species is easily propagated from both seed and cuttings. I successfully rooted my cuttings in an outside cold frame and in a glasshouse in a mist unit with bottom heat.

Any one wishing to grow this interesting plant can write to me to obtain propagation material. The address is:-
Mr P.B. Heenan, 88 Braeview Crescent, Dunedin.

References: Allan, H.H. 1961: Flora of New Zealand Volume 1.

Given, David R. 1981: Rare and Endangered Plants of New Zealand.

Wall, A. 1930: Appendix on the Plant-covering of the Spit. Transactions New Zealand Institute 61.

EXAMINATIONS

Before commencing writing, students must read the question and understand what is required.

It is important to note the overall value of the question, and the value of each part in relation to the time which the student will allocate for the answer as a whole, and for each part (especially necessary where parts are of unequal value).

In preparing an answer it is sometimes of value for the student to prepare, in the answer book, a rough outline of the answer for their own guidance. This material should be crossed out as it is to assist the student and is NOT for the examiner.

Examination Board

LETTERS TO THE EDITOR

This past week I spent time browsing through past R.N.Z.I.H. Journals, mainly from the years 1958 - 64. The Journal in those days was called "New Zealand Plants and Gardens", and was published quarterly. One notable feature of the Journals I read was the regular contributions that were made by such people as B. Balch of Dunedin, L. Metcalf then from Christchurch, and R. Jellyman from New Plymouth. Their articles were simply titled "Notes from ...." and covered many aspects of horticulture, including plants, horticultural practices, current work being undertaken in their city, and seasonal conditions.

Today the R.N.Z.I.H. has both an Annual Journal and a quarterly Bulletin as well as District Council Newsletters.

The point I wish to make is this, I am sick and tired of reading in the editorial, of this, the quarterly Bulletin, requests for more articles and feedback from members, both student and otherwise. Why can't more members be more responsive and put pen to paper and write a few lines on something of interest to themselves or that may be helpful to others in the trade. Especially, why can't more administrators, curators, and managers put pen to paper. Most of you people have a wealth of information and knowledge to share from your experiences in the trade. You don't have to be a literary genuis nor write articles for every Bulletin, but some regular contributions like those of the 1958 - 64 period mentioned earlier gave the publication a good base, additional articles are then a bonus. To those people who do contribute articles, regular or not, keep them coming, as I for one read them. This is not a criticism of the editors, keep the good work up.

Finally, if the apparent apathy of most R.N.Z.I.H. members reflects where horticulture in New Zealand is at, then I begin to wonder what future does horticulture have? It's your magazine, so contribute something to it!

Yours faithfully,

PETER HEENAN.

RAISING NATIVE TREES

This article is based on the work of A.E. Beveridge, Indigenous Forest Management and J.C. Van Dorsser, nursery, of the Forest Research Institute Rotorua.

Throughout New Zealand interest is growing in the conservation of native trees and in their re-establishment in areas which have been logged. However, probably because it is widely believed that native trees are difficult to raise in nursery beds, few nurserymen have been prepared to provide bare-rooted stock on a large scale.

Container-grown plants of a wide variety of species can certainly be obtained from many commercial outlets, but they are relatively expensive and require special care so that root distortion is prevented.

The FRI experimental nursery has now overcome many of the difficulties associated with the raising of bare-rooted native tree seedlings on a large scale. The nursery techniques used for the major podocarp species (e.g., rimu, totara, kahikatea) and the beeches are described in this article.

SOURCES OF STOCK

Although podocarps and hardwoods can be propagated from cuttings, for large-scale production it is cheaper to raise them from seed. Seed can be either collected from under selected trees in the forest or raked up with the forest humus after seedfall. Natural wildings have also been collected and raised successfully in the nursery.

Seed Trees: In the central North Island, small trees in exposed places or in gardens do not usually bear good quantities of sound seed. For most species, and especially for rimu, seed is best obtained from large mature forest trees with well-formed boles. To collect the seed, hessian sheets are placed beneath selected trees at the time of seedfall (usually between March and May). If the sheets are elevated there is less chance of the seed being eaten by rodents, but all sheets need to be cleared at regular intervals to minimise damage from birds, insects, and rodents.

When mature rimu trees have been felled before peak seed ripening, it is still possible to obtain good quantities of seed by shaking cut branches over hessian sheets.

Forest Humus: Seed can be raked up with humus on the completion of seedfall in early winter. The collecting site should be carefully selected from a locality with a good variety of plant and bird life, and humus samples should be taken from beneath a range of canopy species. This method is suitable for producing a wide range of trees and shrubs for restorative planting in the district from which the humus-stored seed has been collected; for example, from one good site at a forest edge the humus produced a total of 1200 seedlings/m^2 of 40 different trees and shrubs, with broadleaved species being the most common.

However, poor germination caused by desiccation of the humus, and the need to handweed the nursery beds for the first 2 years after sowing may limit the large-scale production of seedlings by this method.

Natural Wildings: Natural wildings have been used for species which do not readily germinate in nursery beds (e.g. miro, matai, tanekaha), or which fail to produce good, regular seed crops (e.g. rimu, matai, tanekaha).

Wildings, 10-20 cm in height, are best lifted in winter and should be transplanted as soon as possible into nursery beds. Shadecloth admitting 50% light is generally provided for at least the first year but in other respects wildings can be treated in the same way as seedlings raised from seed in the nursery beds.

NURSERY TECHNIQUES

Sowing: Seed can be sown directly into nursery beds immediately after collection, but in districts which have cold winters no germination will occur before spring. For such regions it is better to delay sowing until spring and to store the seed in moist conditions at 4°C in containers which allow free circulation of fresh air.

At the FRI nursery, which has a light pumice soil, a slow-release fertiliser supplying nitrogen, phosphorus, potassium, and magnesium is incroporated into the top 5-8 cm of the seedbed at a rate of 250 kg/ha. Podocarp seed is then broadcast-sown (250-300 seeds/m^2), rolled or pressed into the seedbed and covered with a thin layer of soil. The humus/seed mixture is first sieved to remove coarser debris then placed 2 cm deep on the nursery beds.

The seedbeds are kept moist and protected by shadecloth admitting 50% light. As summer temperatures rise seedlings can be damaged if the surface soil is allowed to overheat. Raising the shadecloth will provide sufficient ventilation to prevent this happening, but for those species, such as rimu, which are highly palatable to birds and rodents, it is better to place a second layer of shadecloth admitting 50% light at 2m above the first layer.

Lining-out: Apart from rimu and kahikatea which are left for two years, all other species are lined-out after one year in the seedbed. As all species remain in the nursery until they reach a planting height of 50cm, the spacing between seedlings is determined by the time it takes to reach this height: species which take two years are spaced 7cm apart, species which take five years are spaced 15cm apart.

The surface of the bed is covered to a depth of 1.5cm with a pine-bark mulch (particle size 6-15mm). Without this mulch seedlings of several species have died either through desiccation or through over-heating of the surface soil even when this has remained moist. (Pine duff is also a suitable mulch for smaller-scale plantings. Seedlings grow well when wholly rooted in this medium though they benefit from additional fertiliser after two years.) Shadecloth is provided, but may be removed after a few months for most species and after a year for rimu.

To encourage the development of a compact, fibrous root system, seedlings are undercut to a depth of 10cm before they are lined-out. Lined-out seedlings which have reached plantable size are again undercut during early autumn of the year in which they are to be planted and then wrenched at monthly intervals until lifted for planting out. Lateral root pruning may also be carried out depending on the extent of lateral root growth.

Seedlings are not damaged by the application of herbicides for pre-and post-emergent treatment of weeds.

Planting: To minimise the risk of smothering by ground ferns, and to increase their chance of survival, bare-rooted seedlings are not planted on a site until they are at least 50cm tall. Even better planting stock can be obtained by leaving podcarps in the nursery for a further year, totara and kahikatea in particular have performed well if planted when 80-100cm high, and rimu 2m tall has been successfully established on a cool, moist, upland forest site.

CONTAINER-GROWN STOCK

Container-grown seedlings initially grow faster than bare-rooted seedlings but they are more expensive to produce. They have also proved more difficult to condition in and plant out from the nursery than bare-rooted seedlings, and do not necessarily have a better survival rate.

Probably as a result of the conditioning received in the nursery, the early survival of bare-rooted podocarp seedlings has been consistently high, and such stock is preferred for large-scale plantings. Limited South Island trials with beech have shown that bare-rooted seedlings have a better survival rate than container-grown stock in all except very dry conditions.

	SEED PRODUCTION	STORAGE CHARACTERISTICS	SEED PREPARATION	GERMINATION IN NURSERY BEDS	TIME IN NURSERY FROM SOWING TO PLANTING OUT AT 40-60CM HEIGHT
RIMU *Dacrydium cupressinum*	Seed crops highly irregular in quantity and quality, especially at higher altitudes. Moderate or heavy crops can occur in 2 consecutive years and light or negligible crops over 1-4 years. High incidence of empty and undeveloped seed in some localities. Seed with fleshy red receptacles usually sound. Seed highly palatable to rodents and some insects and birds.	In very moist conditions at 4°C with free air circulation maximum storage period 18 months. Some undeveloped seed will ripen during storage.	Separate empty seed by flotation. Rub carefully to remove fleshy receptacles. Store seed for 6 months and sow in spring in cooler localities.	If sown in spring (October) after moist cool storage germination will start in 4 weeks and continue over 12 weeks.	4 years
KAHIKATEA *Dacrycarpus dacrydioides* Synonym *Podocarpus dacrydioides*	Mature trees may produce heavy crops in some years and negligible crops in others. More frequent crops in pole stands at lower altitudes. Pattern of seeding local. High proportion of sound and viable seed when heavy crops produced.	In moist conditions at 4°C maximum safe storage time 12 months. Liable to germinate in cool store after 12 months especially if temperature not constant.	Rub seed carefully to remove fleshy receptacles. If seed placed in plastic bags in very moist conditions receptacles will rot and are then easily removed without rubbing which can damage the soft seed. Sow seed in spring in cooler localities.	When sown in spring even mass germination occurs in 2-4 weeks. Seed bed must not be allowed to dry out.	3 years
TANEKAHA *Phyllocladus trichomanoides*	Irregular crop pattern in central North Island. High incidence of empty seed in some localities, and uneven seed ripening on small trees.	Not known	Not required; ripe seed falls from firm receptacles.	Seed collected from trees failed to germinate in FPI nursery; some success in more northern nurseries. Seed in humus collected beneath seed trees has produced seedlings. Viability of seed normally low in central North Island.	3 years

MATAI *Podocarpus spicatus*	Occasional trees may bear heavily, but good crops rare in most localities. Much seed damaged by insects and rodents. When black fleshy seedcoat develops seed is usually sound.	Seed buried in humus on forest floor can remain dormant for 1-4 years.	Storing seed in moist forest humus for 2 years before sowing leads to more rapid germination.	Seed collected in forest humus under stands of mature trees may germinate in 6-12 months if humus spread on nursery bed.	5 years
MIRO *Podocarpus ferrugineus*	Annual crop fluctuates in abundance. Seed very palatable to rodents. Most seed is sound when red fleshy seedcoat develops.	Seed remains dormant on forest floor for at least 2 years and up to 5 years.	As matai.	Freshly-collected seed did not germinate in nursery beds. If seed is present in forest humus spread on nursery bed, germination occurs in 6-12 months; however, most seed on forest floor is usually destroyed by rodents.	5 years
TOTARA *Podocarpus totara*	Annual crop which fluctuates in abundance. Some trees produce empty seed even though fleshy red receptacles may develop. Seed remains green when ripe. Not destroyed by rodents or birds.	Can store for 6-18 months in moist cool conditions at 4°C.	Rub seed carefully to remove fleshy receptacles. If seed is sown in autumn immediately after collection seedling emergence may be more even.	Germination often irregular after spring sowing. A second period of germination sometimes occurs in autumn and occasionally 1 year after spring sowing. Spreading of forest humus containing seed on nursery beds can result in good germination.	2 years
RED AND SILVER BEECH *Nothofagus fusca* *Nothofagus menziesii*	Good crops every 2-3 years, though may be longer for silver beech on West Coast of South Island.	Seed successfully stored for up to 8 years in airtight containers at 5-10°C and 6% moisture content.	After long dry storage soak seed and keep in moist cool storage at 2-4°C for 3 months with free air circulation before spring sowing.	Rapid even germination occurs 2-4 weeks after spring sowing.	Red beech 2 years Silver beech 2 - 3 years

FROM THE TECHNICAL CORRESPONDENCE INSTITUTE

NEW STAFF

Three new tutors have joined the horticultural staff at the Technical Correspondence Institute in the last few weeks.

Claire Basham has come to T.C.I. from Rainbow Nurseries in Auckland. Claire has had botanical garden and forest nursery experience also. She has Bachelor and Masterate horticultural degrees from Massey University, and has particular interests in plant propagation, nursery practices and native plants. At T.C.I., Claire will be tutoring botany, and nursery related subjects.

Don Estcourt has worked as a nurseryman and a Ministry of Agriculture and Fisheries field officer. For the last three years Don has run his own garden centre in Hastings. Don gained his Trade Certificate in Horticulture and Gardening in 1967 and the National Diploma in Horticulture in 1971. Don will be tutoring a range of horticultural subjects.

Roger Garrett has come to T.C.I. to teach horticultural management subjects. Roger has a keen interest in grape growing and will also be tutoring some Certificate in Horticultural Practice viticulture students. Roger has a Batchelor of Agricultural Commerce degree, a Diploma in Horticultural Science and a Masterate in Applied Science, all from Lincoln College.

R.N.Z.I.H. EXAMINATIONS

The staff of the Horticulture Department at T.C.I. wishes everyone sitting examinations this year all the best. If you are studying with T.C.I. and have any queries in the next few weeks, do not hesitate to ask your tutor's advice. Any enrolled T.C.I. student may obtain a copy of the T.C.I. Guide to Examination Success by asking one of their tutors to send a copy to them.

Three pieces of advice for exam candidates are:

1. Read questions carefully and make sure you answer what the question actually asks.

2. Make sure you provide the examiner with as much information as you can in the time you are given. Your "job" is to convince the examiner that you have a good knowledge of the topics you are answering questions on.

3. Use practical examples of things you have seen or done at work or on other properties to illustrate your answers to questions. It is important that you show your examiners that you can apply theoretical ideas to practical horticultural situations.

WEATHER AND YOUR GARDEN

The following is the second in a series of articles taken from New Zealand Meteorological Service Publication No. 168.

by

R.W. Heine

PLANTS AND CLIMATE

Air Temperature

The main influence of air temperature on plants is in controlling the speed of the chemical reactions taking place. Not only do these control growth rates, but also the hormonal mechanisms responsible for flowering and fruiting.

An example of this is seen in growing lettuces. If the temperature is too high (above about 21°C), then instead of heads forming the plant bolts, i.e. forms a flower stock. Another example concerns tomatoes: optimum night-time temperature for fruit set is between 15 and 20°C, and above 22°C blossom begins to fall off.

No plants show much growth below 10°C, and some require even higher base temperatures. For example, dwarf and runner beans, kumaras, leeks, pumpkins, sweet corn, and tomatoes require 16°C for effective growth. Cucumbers require from 18°C up to 30°C, and their night-time temperatures should not fall below 15°C.

When it comes to fruit trees, air temperature plays two complementary roles. Not only are warm temperatures required for bud growth and ripening of fruit, but a period of cold temperatures is required - a dormancy period - before spring growth will occur properly. The colder it is, the shorter the dormancy period. As an example, a peach tree requires a dormancy period of 800 hours at 6°C, but 1600 hours if the temperature only falls in winter to 14°C. Following dormancy, air temperatures then play a role in determining the period to blossom; for a peach 510 hours at 15°C is needed, less if the temperatures are higher.

Closely related to air temperatures and gardens, are the activities of bees. Until temperatures reach about 10°C, bees cannot fly and, unless it is a sunny, calm day, they are not reasonably active until the air temperatures reaches 13-14°C. Thus, after a cold spring night, foraging may only occur for a short period during the middle of the day; a further factor under these conditions, is that a low night-time temperature may reduce nectar secretion sufficiently to make clever bees stay at home. While on the topic of bees, two further points

are of interest, in that they emphasise the need to keep hives close to the fruit trees. Bees have a top speed of about 6 metre/sec (22 km/hour) so that strong winds restrict their range, and they also require a minimum light level, so that overcast gloomy conditions will also restrict their range.

Soil Temperatures

Soil temperatures are important for two reasons: the germination of seeds, and the likelihood of frost occurring. Although soil temperatures are easily measured, just where (i.e. what depth), and when (what time of day) they should be measured is not so easily determined. During the day the heat from the sun flows downwards into the soil, and at night this process is reversed and the heat flows upwards to the surface. The upshot of this is, that the temperature of the soil at the surface keeps in step with the sun, while the temperature response of the deeper layers of soil lags further and further behind, Table 1. In addition the range of temperature during a 24 hour (diurnal) period becomes less and less with increasing depth, and by 30 cm (1 ft) the diurnal changes have died out altogether.

Table 1 Times of Maximum and minimum soil temperatures (loam and clay soils)

Depth	Maximum (NZST)	Minimum (NZST)
5 cm	3 p.m.	6 a.m.
10 cm	5 p.m.	7.30 a.m.
20 cm	9 p.m.	10 a.m.
30 cm	1 a.m. (next day)	1 p.m.

Note 1 : for sandy soils subtract half an hour.

2: add one hour during N.Z. daylight (summer) time

Soil temperatures also affect root growth. Tomato roots will not grow at soil temperatures less than about 14°C, so that it is no use trying to raise these plants at lower temperatures - they may survive, but will probably be checked severely. Potatoes require a soil temperature of 9 -10°C to sprout.

Germination Temperatures

The germination temperatures given in Table 2 are for optimum yields, and do not represent the absolute minimum temperatures that seeds need to germinate. They refer to seed depth, so that you will have to develop some relationships between these values and the soil temperatures at the depth you have placed your soil thermometer. Bear in mind that, as the soil thermometer is deeper than your seeds, it will err on the safe side from the planting point of view.

Table 2 Germination temperatures

10°C	broccoli, brussels sprouts, cabbage, carrot, cress, endive, lettuce, onion, parsley, parsnip, pea, potato, radish, sage, shallot, silver beet, spinach, swede, turnip.
16°C	artichoke, asparagus, beans (Broad, Dwarf, Runner), beetroot, cauliflower, celery, chinese cabbage, kumara, leek, marrow, pumpkin, squash, sweet corn, thyme, tomato.
18°C	beans (Lima, Soya), capsicum (pepper), cucumber, eggplant, melon (Rock, Water), oxalis (yam).

While some of your cabbage seeds, for example, may germinate at a soil temperature as low as 4°C, you will get little growth while air temperatures remain below 10°C, as mentioned above.

Soil Moisture

The response of a plant to soil moisture conditions depends on the type of plant, and its rooting habit, and the soil moisture itself depends partly on the soil type. Annuals (and biennials) are generally more sensitive to variations in soil moisture than perennials, and this is partly a result of differences in the volume of soil occupied by the roots.

For maximum crops of Broad and French beans, it is essential that the soil is kept watered during flowering. Water during the development of the pods is also beneficial. (Whether a shortage of water between sowing and flowering is important, is not clear from research work).

For tomato plants, a shortage of water during flowering and fruiting influences both fruit size and the number of tomatoes obtained. This is partly because at the start of fruiting root growth almost ceases, and the plant becomes very sensitive to water shortage. It is a general principle of growth in fact, that rate of root growth is hastened by vigorous leaf growth, and retarded by fruit growth. In this respect cucumbers are similar to tomatoes in that they fruit throughout their lives, and hence require frequent replenishment of water in the upper layers of the soil.

Lettuce differs from tomatoes and cucumbers in that it fruits (if not picked for eating) at the end of its growing cycle, so that root formation is continuous for most of the season. Continuing moist conditons are therefore required for lettuce, particularly during head formation, and similar comments apply to cabbage.

For cauliflowers, watering throughout growth is needed, but in particular in the early seedling stage or just after planting (where lack of water leads to an abnormally small 'head' size), and when the 'heads' are growing rapidly (where lack of water leads to browning of the 'heads'.)

For potatoes, adequate water is needed from tuber initiation right through almost to maturity. A plentiful supply of water before tuber initiation increases the number of tubers per plant, while a plentiful supply after this stage increases the size of the tubers.

In the case of deciduous fruit trees water is needed during the spring and early summer for rapid shoot growth and fruit set; but what is perhaps not realised is that water supply conditions in the previous late summer and early autumn have an indirect effect on shoot growth and yield. Apple buds are produced during this latter period, on short lateral shoots or 'spurs', and whether or not flowers will be formed in the spring depends on a satisfactory rate of growth of these spurs. As well as high autumn temperatures therefore, one might expect high levels of moisture to be an advantage then, but in fact a certain amount of soil dryness actually leads to an increase in the number of flowers. Apple trees should be well watered until the fruit is about half size; after this, watering should only be needed if the soil becomes very dry.

Delphinium

Delphinium ajacis

Ranunculaceae

FRUIT FLIES — RISK OF ENTRY

(Taken from M.A.F. Ag Link Series)

Fruit flies are one of the most serious pests of agricultural crops. The Mediterranean fruit fly (*Ceratitis capitata*) is probably the world's worst pest of citrus and deciduous fruits. None of the economic species are established in New Zealand, but if this was to happen there would be loss of marketable produce and also increases in the cost of control measures.

DISTRIBUTION

There are over a thousand different species of fruit flies. They occur in nearly every country in the world, but the number of economic species is comparatively small. New Zealand has several native species of fruit flies, but none of them are pests. Some of the most important overseas pests are:

MEDITERRANEAN FRUIT FLY (medfly) which occurs in the Mediterranean area, Africa, Europe, Central and South America, Hawaii and Western Australia.

QUEENSLAND FRUIT FLY (*Dacus tryoni*) which occurs in eastern Australia as far south as Victoria and has also spread to Papua New Guinea, New Caledonia, Austral Islands and Tahiti.

ORIENTAL FRUIT FLY (*Dacus dorsalis*) which occurs in southern Asia and neighbouring islands including Sri Lanka, Indonesia, Taiwan, Philippine Islands and Hawaii.

MELON FLY (*Dacus cucurbitae*) which occurs in Asia, Africa and some islands in the Pacific - Papua New Guinea, Bismarck Archipelago, Bougainville Island, and Hawaii.

APPLE MAGGOT (*Rhagoletis pomonella*) which occurs in the eastern area of Canada and in the U.S.A.

LIFE CYCLE

There are four stages in the life cycle of a fruit fly - the egg, the larvae, the pupa and the adult.

EGGS are white, elliptical, just over 1mm long, and deposited in groups (about 5-9 eggs per group) in an "egg pocket" just under the skin of the host fruit. Several egg pockets may be found in a single fruit. The egg laying punctures caused by the ovipositor are sometimes called stings, and an experienced person may be able to detect "stung" fruit.

LARVAE hatch from the eggs after a few days. They are whitish or cream coloured, up to 10 mm long when full grown, strongly tapered at the head end, and comparatively broad and squared off at the posterior end. They resemble blow-fly maggots. The larval stage lasts 1-2 weeks. Larvae have an unusual habit of flicking the body - so that they can 'jump' several centimetres.

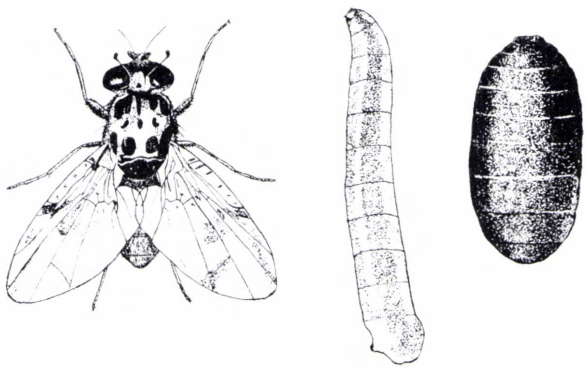
The larvae should not be confused with those of the vinegar fly or small fruit flies *(Drosophilidae)* which are similar in appearance, but much smaller, reaching a maximum size of 5 - 7 mm. They usually only occur in over-ripe or rotting fruit.

PUPA: Mature larvae leave the fruit and drop into the soil where they pupate. The pupae are brown barrel-like structures about 4 - 6 mm long. The pupal stage may last up to 2 weeks in summer or up to 7 weeks in winter.

ADULT: Newly emerged flies drink nectar and honey-dew and also feed on the exudation from damaged or decaying fruits. They feed in this way for 4 - 7 days before they lay their first eggs.

Adults are colourful insects, often black or brown with yellowish markings and patterned wings. They are about the size of a house fly and have a curious habit of slowly raising and lowering the wings when walking.

In Western Australia, the length of the life cycle of medfly varies from 3 - 4 weeks in summer to more than 2 months in winter.



Life stages of the Mediterranean fruit fly (*Ceratitis capitata*) (not present in New Zealand).

DAMAGE It is the fruit fly larvae which attack ripe or ripening fruit on the tree. Fruit may appear quite sound, but the damage may not be noticed until it has reached the consumer.

MEDFLY attacks more than 200 vegetable and fruit species, including apples, plums, pears and citrus.

Some Mediterranean areas have had up to 100% infestation of medfly in stone fruits. Greece has had 50% losses in citrus.

QUEENSLAND FRUIT FLY the most destructive insect pest of fruit and vegetable crops in Australia, has been recorded from over 100 plants including citrus, plum, pear, apricot, apple and tomato.

ORIENTAL FRUIT FLY has been recorded from more than 150 kinds of fruit and vegetables and melon fly from more than 125 species of plants including cucurbits, tomatoes and many other vegetables.

INTERCEPTIONS

Since 1955, there have been over 300 interceptions of fruit flies, representing at least ten different species, in New Zealand.

Fruit fly larvae are frequently intercepted in fruit entering New Zealand from overseas and in many cases adults have been reared from these interceptions.

Live adults of medfly were found in a MAF office in Christchurch in 1962. In 1974, adults were reared from apples entering New Zealand from Argentina. Recently there was an interception in oranges from Spain.

In 1907, there were outbreaks of medfly in peaches being grown at Napier, and in both peaches and tomatoes near Blenheim. In 1908 there was an outbreak at Auckland. Fortunately, prompt action eliminated these outbreaks and there has been no repetition since. However this does show that medfly can establish in New Zealand if given the opportunity.

One of the commonest fruit flies intercepted is *Dacus xanthodes* in pawpaws from Western Samoa. It also attacks pineapple, citrus, guava and tomatoes and has the potential to become a serious pest in New Zealand if introduced into areas where extensive horticulture is carried out.

Dacus facialis is frequently intercepted in capsicum from Tonga. It is known to infest a range of fruits and vegetables including citrus, peach, mango, guava and tomato. It is a serious pest.

Queensland fruit fly has been intercepted in citrus, mango and apples from Australia, Papua New Guinea and Tahiti.

Oriental fruit fly was recently intercepted in litchi fruit and mangoes from Hawaii. Melon fly was intercepted once in 1978 in fruit from India.

Anastrepha suspensa was taken from grapefruit from Peru in 1977. It is an important pest in South America, attacking peaches, citrus, cherries and pears.

ENTRY

The most likely means of entry into New Zealand is as larvae in non-commercial fruit. Coastal yachts, aircraft (particularly military) and ships galley stores are rated as the highest risk.

The careless discarding of infested fruit could mean that larvae will complete their development and emerge as adults in New Zealand. If there are sufficient numbers and suitable host plants nearby, an infestation could develop.

There is little risk of entry in commercial fruit as this usually comes from "safe" areas or is fumigated or chilled before entry.

The most likely area of entry is considered to be the east coast of the North Island from Tauranga to the North Cape, and via International airports including Whenuapai and Ohakea.

EFFECT ON NEW ZEALAND

Should fruit fly pests become established in New Zealand the effects are likely to be very serious for our fruit industries.

The added cost of control methods would be severe for the commercial orchardist and the presence of a new pest could disrupt integrated control programmes.

Perhaps even more serious would be the effects on our export markets, some of which could be closed. Other countries would place quarantine restrictions on our fruit (such as fumigation or chemical treatments) thus adding to the cost of exports, or making some uneconomic.

ERADICATION

The major key to an eradication scheme is firstly, an awareness of what the pest looks like and the type of damage it causes; secondly, the need to be well prepared if an outbreak occurs and finally efficiency in dealing with a reported outbreak.

Contingency plans have been developed whereby trained, equipped teams will be able to move into an infested area at short notice, and by means of bait sprays and special traps should be able to contain and eventually eliminate any infestation.

Fruit fly traps are in operation at Mangere airport, Auckland to detect the presence of medfly or Queensland fruit fly. Traps are also present at the port area in Auckland and in Hastings, Kerikeri and Hamilton.

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