

Plants as Infrastructure

RNZIH Conference @ Unitec New Zealand

Carrington Road, Mt Albert, Auckland

24-25 March 2006

Welcome to the
Royal New Zealand Institute of Horticulture's
annual conference 2006.

Understanding **Plants as Infrastructure** gives a whole new perspective on their role in our cities. Strong evidence of the myriad values of urban planting systems is required in order to gain support, appropriate resources and expertise at local and regional levels. This conference aims to reinforce that body of evidence and share best practice in planning, designing and managing planted systems at a wide range of scales.

We hope you enjoy the conference and would like to thank our sponsors for their generous support in making this conference possible.

Penny Cliffin
Conference Convenor

sponsors:



NZ Institute of Landscape Architects Education Trust.

THURSDAY

Public lecture @ School of Architecture & Landscape Architecture, Building One, Unitec, Carrington Rd, Mt Albert – *Drinks* from 6.00pm in main foyer.

7.00pm **Joan Nassauer** - Normative scenarios for landscape change - engaging science to design the future (interdisciplinary research projects).

FRIDAY Red Lecture theatre - Building 180

8.45am Welcome – RNZIH President – Jack Hobbs

9.00am Opening address: Christine Caughey (Auckland City)

9.30am Keynote Address: Landscape Infrastructure: At all scales – Prof. Joan Nassauer – University of Michigan

10.30am *Morning tea*

11.00am **Water management or Urban planting (parallel sessions)**

Water management:

Led by Assoc. Prof. Dushko Bugunovich (Unitec)

- Botanical Wastewater Treatment Systems - Green Infrastructure for Peri-urban Areas – Tim Rimmer, Daphne Mitten (Unitec) Uli Rambeck (Pure by Plants Ltd)
- The use of plants in mitigating flood problems in urban infrastructure developments in Malaysia – Dr Dani Salleh (Northern University of Malaysia)
- Streamside planting trials - Leslie Haines & Jacqueline Margetts (Unitec)
- The aesthetics of waterway naturalisation – Toby Barnham (Lincoln University)

OR

Urban planting:

Led by Penny Cliffin (Unitec)

Infrastructure Planting Design – Nick Robinson (Studio of Urban Landscape Ltd)
Rooftop gardens – Robyn Simcock (Landcare Research)
Assessment of Hazardous Trees– Rob Graham (Wintec)
Historical planting patterns in Auckland – John Adam (Unitec)
Coastal projects – Mark Dean (Naturally Native Ltd)

1.00pm *Lunch*

1.45pm **Case study** – Waiatarua Reserve. Grant Ockleston (Auckland City)

2.30pm **Fieldtrip**
Cornwall Park, Water management systems @ Waiatarua Reserve, Auckland Regional Botanic Garden

5.30pm *Drinks* at ARBG Miko Café

6.30pm *Dinner* at ARBG

8.00pm **After – Dinner speaker** – Jack Crow (ARC)

9.00pm Return to city

SATURDAY

9.00am Morning Session – Infrastructural planning and design.

Recent Peter Walker & Pnrs Auckland projects – John Gundesen (Innovus), Orson Waldock (Isthmus Group).
Landscape Development agendas - Colin Muerck (Landcare Research)
Satellite imagery – Stella Belliss & Heather North (Landcare Research)

10.30am *Morning tea*

11.00am **Fieldtrip** with picnic lunch
University of Auckland botanical collections, Albert Park, Inner city street planting, street trees.

2.30pm **Afternoon final session:**

- Achieving great outcomes through multidisciplinary teams – Kim Barrett (Project Manager, Haydn & Rollett Construction)
- Cultural sustainability of urban greening: Maintaining ecological advances. – Joan Nassauer – Reflections on NZ visit.

Drinks and nibbles to finish up with guided visit to Unitec Vertical Composting Unit, tree collection and hortecology sanctuary.

PROGRAMME

ABSTRACTS RNZIH Conference 06

4 PROFESSOR JOAN IVERSON NASSAUER

Keynote Speaker Profile

5 TIM RIMMER

Botanical Wastewater Treatment Systems – Green Infrastructure for Peri-urban Areas

6 DANI SALLEH

The use of plants in mitigating flood problem in urban river infrastructure development in Malaysia

7 LESLIE HAINES AND JACQUELINE MARGETTS

How can urban riparian planting chime with residential garden design? – amenity planting trial for urban streamside

7 JOBY BARHAM

The aesthetics of waterway naturalisation: Post Occupancy Evaluation of the Waterways and Wetlands Asset Management Strategy in Christchurch, New Zealand

8 NICK ROBINSON

Design of planting infrastructure

9 ROBYN SIMCOCK

Indigenous New Zealand greenroofs: a Waitakere case study land possible planning incentives

9 ROB GRAHAM

Assessment of Hazardous Trees

10 JOHN P. ADAM

Archaeological Infrastructure of Wai-te-mata (Auckland) 1820-1850.

10 GRANT OCKLESTON

Waiatarua Wetland Restoration, Auckland City

11 JOHN GUNDESEN AND ORSON WALDOCK

Recent projects by Peter Walker and Partners in The Auckland Region

12 COLIN MEURK

Plants are the Infrastructure to Ecological and Cultural Integrity

13 STELLA BELLISS / HEATHER NORTH

Urban impervious/greenness maps derived from satellite imagery

14 KIM BARRETT

Achieving Great Outcomes through Multi-discipline Teams

15 FIELD TRIPS



Abstracts

Keynote Speaker Profile

Professor Joan Iverson Nassauer

Joan Iverson Nassauer is Professor of Landscape Architecture in the School of Natural Resources and Environment at the University of Michigan. She specialises in landscape ecology and landscape perception, and is interested in the application of these in the design of settled landscapes. She has previously chaired the United States International Society for Landscape Ecology, and has helped to build plans and designs, at federal, state and local government levels, for the improvement of ecological health with aesthetic experience. She has worked as an advisor to United States Senate Committees and is an internationally respected figure in the field of agricultural change.

Professor Nassauer is challenged and excited by an interdisciplinary mission to bring together people from different disciplines to work on landscape issues, and consequently enables her personal work to deepen.

She is passionate about understanding the many related factors influencing landscape change – cultural and natural and their ecological consequences and she is currently researching several areas of particular interest. These include the retrofitting of cities – especially brownfield sites – in order to facilitate ecological function and water quality, perceptions of ecologically innovative exurban development patterns, the use of alternative policy scenarios and futures to monitor landscape change, and watershed planning and management in both agricultural and urban settings. Joan will speak on a range of these topics during the conference.

TIM RIMMER

TITLE: Botanical Wastewater Treatment Systems – Green Infrastructure for Peri-urban Areas on Waiheke Island

Most households on the island have their own on-site wastewater system and for various reasons centralised reticulation is viewed as an unreasonable and unwanted option by the majority of residents. Effective on-site treatment of used water is therefore critical in maintaining public health and the Island's ecosystems .

With growing awareness for the need to implement ecologically sustainable practices, more and more people are looking to the integration of on-site treatment and landscaping. In its most common form this generally involves the use of technical treatment plants pushing effluent into drip lines for irrigation of gardens.

Another approach involves the use of a Botanical Wastewater Treatment System. Resulting effluent is treated to a high standard with a relatively low energy and resource use footprint. In addition, such a system can be adapted to suit most existing land conditions, utilised to provide wetland features to a garden, enhance biodiversity as well as provide treated water for irrigation and other potential uses.

This paper highlights several examples from Waiheke. Two systems are in operation: one since 1999, the other since 2004. Two more are in the planning stage. Another system is under construction in the Clevedon Area.

We believe these green systems showcase the integration of plants as infrastructure with appealing landscaping. They are versatile in application, involve low maintenance – mainly weeding – and present themselves as desirable garden features that provide a particular ecological niche.

Botanical Wastewater Treatment Systems deserve full acceptance by regional and local authorities.

Co Authors:

Daphne Mitten: NZILA & Unitec, Carrington Rd, Mt Albert, Auckland.

e: daphnemitten@paradise.net.nz, **ph:** 09 372 9272.

Uli Rambeck: Pure by Plants, 35 Ridge Rd, Waiheke Is. **e:** ulir@clear.net.nz,

ph/fax: 09–372 9565

Tim Rimmer: Unitec, Carrington Rd, Mt Albert, Auckland. **timrim@ihug.co.nz**

or **trimmer@unitec.ac.nz ph/fax:** 09 372 9336.

TITLE: The use of plants in mitigating flood problem in urban river infrastructure development in Malaysia

Fast urban growth creates demands for various development projects as accelerated by strong growth in industrial sector and reinforced by dynamic property market sectors. The concentration of urban population and expansion of existing development areas requires rapid implementation of various types of infrastructure projects. The increase of large scale development projects has produced greater challenge to local authorities to make the urban environment sustainable and liveable. However, improper execution of the projects, especially those located in sensitive development areas, would be harmful to the hydrological regime of river basins. Various countermeasures have been identified to monitor urban river basins. Meanwhile, the adequate provision of infrastructure has to be provided and at the same time it has to protect the natural and built environment.

Generally urban water management is strongly affected by climatic, socio-economic and institutional arrangement and these may vary among countries, or even regions. In Malaysia, the increase in population as a result from urbanisation brings about the increase in water demand and this gives rise to the necessity of water resources development. This is the first of the major hydrological problems. The increase of population density and increase the building density also increases the quantity of waterborne waste. This contributes to the deterioration of storm water quality. Actually, in the country flood disasters are caused by several factors, e.g. i). The increase of natural disasters in urban areas; ii). Increase of inundation caused by insufficient drainage capacity; and iii). Increase of flood damage density due to the high concentration of population and new development projects. In order to avoid that, various mitigation measures have been formulated and put forward inline with urban water management through the approach of 'Integrated Urban Water Management'. Therefore various counter measures have been taken in mitigating the environmental consequences. Hence, planting was identified as an effective, economic and environmentally friendly method available to be incorporated in river based infrastructure development in managing urban river water infrastructure development.

The concept of 'Integrated Urban Water Management' consists of two main components, which are a structural component and plant a component. The concept creates a wide range of aspects such as acquiring spaces for recreational, sports activities

and walkways, amelioration of microclimate condition, inhabitation of aquatic fauna and flora. Rivers in some states in Malaysia have characteristics affected by topographic and climatic conditions; historically floods have often occurred when towns and settlements are established within flood prone areas. Under these circumstances, flood mitigation has always been considered a social necessity.

The river has many aspects of landscape components in relation to human activities and nature. The natural characteristics of rivers are diversified form and dynamics within the riverside areas. The landscape (plants) components of the river are generally divided into to two categories which are attributed the area within the river and the surrounding area of the river.

The main purpose of river based infrastructure development is to control flooding as efficiently as possible by incorporating the plants as the main components. Growing public concerns demands the utilisation of plants (fauna and flora) for recreational purposes. In response, a development concept themed 'Development Facing River' which using plants as the main component was welcomed by most local planning authorities in the country. No doubt, rivers generally have three aspects of function such as river water control, water utilization and environmental creation aspects. High growth expansion rates of social and economic growth have long been associated with river water control by means of mitigation of flood damage to people's lives and diversification of river water utilisation. In recent years, the environmental function of the river in urban areas has been recognised as equally important.

Therefore, the discussions of this paper will focus on some strategies that have been outlined by respective authorities in Malaysia in managing urban water management by integrating planted components (landscaping programmes) into river based infrastructure development plans.

Profile: *Senior Lecturer at Department of Development Management, Faculty of Public Management and Law, Northern University of Malaysia and also Board and Corporate Member of Malaysian Institute of Planners (MMIP)*

TITLE: How can urban riparian planting chime with residential garden design? – amenity planting trial for urban streamside

Current research on riparian planting is focussing on re-vegetation. This emphasis on native plants and their associated ecological values is appropriate for much riparian planting, especially where native biodiversity is to be maximised. Non-native plants often have the potential to enhance ecological values (such as faunal habitat) too. When an urban stream flows through private property, visual amenity also becomes important. Designers, who, while wishing to maintain or enhance the ecological values of the stream, also have to attend to aesthetics - they have to ask how the riparian planting can chime in with the design of the rest of the garden.

Designers need to be able to select from a broad range of plants, both native and exotic, and know that their choice is appropriate in terms of bank stabilisation and flood tolerance while at the same time possessing the desired aesthetic characteristics. During the plant selection process, consideration needs to be given to the potential for species invasiveness. Non-native water dispersed plants (whatever the characteristic of the propagule) are of particular concern. As well planting design has a role to play in the suppression of weeds, effectively minimising the need for mechanical and chemical plant mass reduction.

The benefits of offering a wider range of suitable plants are that designers will be encouraged, not only to consider more carefully the planting of the stream sides, but also be guided to choose those species which are most suitable for the task, rather than using species "on a wing and a prayer" which look good, but not knowing if they will also do the 'ecological' job.

Leslie Haines and Jacqueline Margetts
Lecturers in Landscape Architecture, Unitec.
e: lhaines@unitec.ac.nz
e: jmargetts@unitec.ac.nz

TITLE: The aesthetics of waterway naturalisation: Post Occupancy Evaluation of the Waterways and Wetlands Asset Management Strategy in Christchurch, New Zealand

The naturalisation of Christchurch's waterways is restoring ecological diversity and creating a new aesthetic. However, a conflict has developed with more conservative residents. As can be seen from a review of Letters to the Editor of the Press, some members of the public cling dearly to the English heritage aesthetic that has historically shaped the form of waterways. Other residents believe that the landscape of Christchurch should reflect the buried natural heritage. The solution is emerging as a blend of various ideals that are contributing to a new complex aesthetic.

This paper undertakes a critical review of Christchurch City Council's Waterways and Wetlands Asset Management Strategy (1999) and its contribution to the aesthetic of natural infrastructure in Christchurch City. Waterways naturalisation is creating a unique form that reflects a variety of residents' ideals. But are these locations also battlefields where guerrilla plantings of exotics infiltrate the 'native only' plantings of the Council?

Conflicts over the 'look' of ecological restoration are not new. Nassauer (1995) highlights that people often have mixed responses to the design of ecological restoration. Culturally familiar aesthetic models can be used to mitigate negative responses. In parallel to analysis of the Strategy, the paper discusses the potential use of Nassauer's 'Cues to Care' to mitigate negative responses to the aesthetic of naturalised rivers through, for example, the acceptance of exotic plants as part of ecological restoration. Could this herald a truce on the battlefields of natural infrastructure? How will the 'Cues to Care' treaty be drafted in Christchurch?

Joby Barham
Master of Landscape Architecture graduate from Lincoln University.
e: jobybarham@gmail.com

Reference: Nassauer, J. (1995). Messy Ecosystems, Orderly Frames. Landscape Journal vol. 14, no. 2.

TITLE: Design of planting infrastructure

The concept of infrastructure and its relevance to landscape architecture. Infrastructure as large scale pattern, as connectivity, as foundation. Infrastructure planting as spatial and habitat structure of the landscape. Infrastructure provision for development sites may include advance provision of transport, utilities, and open spaces; should also include planting and habitat framework.

Current approaches to planting design in New Zealand – decorative, picturesque, quasi-ecological and symbolic. It is hard to find examples of planting design that display strong spatial or sculptural qualities at larger scales. Most the large scale planting is in the category of re-vegetation and may establish forest cover, but is rarely planned for spatial diversity of the planting or within the canopy structure itself.

Comparison of the spatial approach with the object-oriented approach; the landscape as setting and place compared with the landscape as object. The role of large scale, connected plant communities in creating liveable, sustainable environments.

Examples of inspiration and precedent in international landscape architecture – historic and contemporary designers who have been successful with large scale planting, and sites that demonstrate successful planting infrastructure. These are illustrated along with New Zealand examples.

Potential of native plant communities as a palette of spatial structures that employ the diverse range of distinctive physiognomy for functional and aesthetic purposes. On a smaller scale, how planting can create intimate spaces developed from typical agriculture and traditional horticulture including orchards, olive groves, vineyards, meadows, tree training, etc. The scope for referring to distinctive NZ spatial idioms such as kiwi orchards, vineyards, kumara stone gardens, taro gardens, pine plantations, etc. is explored.

The barriers to achieving planting infrastructure in New Zealand are considered– economic, historic, professional, social–cultural.

What if?– opportunities are described for infrastructure planting in New Zealand – residential expansion, neighbourhood parks and reserves, acquisition of new regional parks, focus on urban design in streets and squares, car parks, commercial and industrial developments, wetland reserves, botanical gardens.



Profile: *Nick Robinson is a landscape architect and lecturer with a portfolio of design and academic work in New Zealand, USA and UK. Nick has championed the role of planting, seeing it as fundamental to landscape design and environmental quality at all scales. His internationally acclaimed text book, the Planting Design Handbook has promoted this understanding to students and professionals over the ten years since it was first published. Nick is currently practicing in Auckland with Studio of Urban Landscape."*

e: nick@landscapearchitecture.co.nz
ph: 09 817 3788, **fax:** 09 817 3789

TITLE: Indigenous New Zealand greenroofs: a Waitakere case study and possible planning incentives

Greenroofs can achieve multiple environmental benefits, most importantly reducing the pressure on stormwater infrastructure by retarding and reducing stormwater runoff but also increasing native biodiversity in cities, particularly if native plants are used. In 2005, Waitakere City supported the testing of plants and substrates in a laboratory and field trial in preparation for construction of a 500m² greenroof in 2006. The paper identifies the criteria for successful greenroof media, compares the two media field tested in December 2005, and identifies the best-performing native vascular plant species for such relatively droughty and highly exposed sites.

The widespread application of greenroofs in New Zealand will occur if planning policy provides incentive programmes to offset the initial capital cost of greenroof construction. Non-regulatory and regulatory methods formulated by other countries that have successfully encouraged the use of greenroofs will be presented, focusing on methods can be adapted to the New Zealand planning framework.

Robyn Simcock
Landcare Research, Private Bag 92170, Tamaki, Auckland, New Zealand
e: simcockr@landcareresearch.co.nz; **ph:** 09 574 4100; **fax:** 09 574 4101

Logan Whitelaw
University of Auckland, Auckland, New Zealand

TITLE: Assessment of Hazardous Trees

For many years arborists have, when assessing hazardous trees, relied on experience, observation, ingenuity, some commonly held views on species failure patterns, and a degree of luck. Tree assessment has been an often uneasy alliance of art and science, limited more by the experience of the assessor and the weight of their opinion than by data and analysis.

The recent development of bio-mechanical principles applicable to hazard tree assessment has set an empirical standard that allows the assessor a degree of objectivity and scientific analysis.

In the mid 1990s a research team at Karlsruhe Research Centre, lead by theoretical physicist and engineer Claus Mattheck, began investigating the bio-mechanical structure of trees – initially with a view to applying their findings to engineered structures. The impact of Mattheck's work has had a radical influence on the understanding and evaluation of trees. Previously seen as physiological entities, trees have also come to be viewed as engineered structures – structures that distribute stress and are subject to external loads in a manner that effects their design, form and "body language". When these stresses and loads exceed safety limits this results in fractures and failures.

My paper will briefly outline the criteria used to assess the safety limits of these loads, and the analytical processes used to evaluate the degree of hazard a tree represents. That is; how much decay can your tree have before it is too much?

Profile: *Rob Graham has spent the last 30 years involved in many aspects of horticulture and arboriculture. He is currently the principle tutor in the Diploma in Arboriculture programme at Wintec, where he has been for the past 10 years. Prior to that he has worked (in descending order) as an arboricultural consultant, tree company manager, council 'Tree Officer', arborist, and general horticultural dogs body. Rob has worked throughout Europe and Australasia as an arborist, and been called as an expert witness in numerous court cases regarding the assessment of hazardous trees.*

Rob has a BA (Auckland University), NDH, CTS (Merrist Wood), and is a qualified teacher. His obsession is trees.

e: rob.graham@wintec.ac.nz

TITLE: Archaeological Infrastructure of Wai-te-mata (Auckland) 1820-1850.

In September 1840 the ship the ‘Anna Watson’ arrived from Russell-Kororarareka with Government officials such as Colonial Surgeon, Architect, Surveyor, Superintendent of Domain and their entourage of Mechanic’s to create a new settlement on an existing settled cultural landscape that can be read from paintings and early photographs.

Central to a permanent settlement was a permanent water supply such as springs in Official Bay and the Auckland Domain where the Government garden was constructed and both Maori and Pakeha gardeners worked to supply the Governor and residents of New Zealand.

Plants feature in all aspects of the design of this economic, spiritual and social landscape history. Garden plants for ornament [political, iconic], food, medicine and shelter; native and imported timbers shipped for the first permanent houses. Raupo *Typha* species, a common swamp plant used to make houses for the mechanics (skilled labourers). Flax, *Phormium tenax*, and peach groves marked both Maori and Pakeha settlements.

The Government supported the trade in what were called ‘Native Productions’, such as flax and bark gathered from native trees for tannin. Willow, *Salix babylonica* became an important infrastructure plant.

Using primary archives, historic paintings and photographs the sweep of human endeavour can be revealed today as mostly an archaeological infrastructure of a new city.

Finally, do we have the contemporary knowledge to identify and preserve some of this urban fabric?

Profile: *John is a self employed landscape historian. His business ‘Endangered Gardens’ has been operated since 1998 . He is currently completing a conservation plan with heritage landscape architect Louise Beaumont on the Percy Scenic Reserve for Hutt City Council.*

e: jpadam@kiwilink.co.nz

TITLE: Waiatarua Wetland Restoration, Auckland City

Auckland City has recently completed the construction of a wetland stormwater treatment system within the Waiatarua Reserve, east Auckland. The 41ha reserve used to be home to a 22ha wetland formed around 9000 years ago when a volcanic eruption isolated the catchment from the sea.

The wetland was utilised by early Polynesian settlers as a source of food that was augmented by clearance of surrounding land for additional crops. Significant modification to the wetland occurred in the 1930s with the inclusion of drainage channels that reduced the wetland size to around 6ha. The channels and use of cattle for grassland and wetland margin maintenance impacted public amenity and resulted in much of its water purification and ecological value being lost.

Restoration of the wetland involved significant public consultation and was constrained by the need for flood protection of neighbouring residential dwellings and challenging geology involving a thin surface crust underlain by as much as 8m of soft peat. In designing work, it was necessary to minimise the depth and extent of both excavation and filling, and design hydraulic control structures that did not require substantial stable foundations. Constructability was also a significant factor in both design and contract structure.

This paper will set out the broad treatment and flow design concepts, and the multiple objectives required as design outcomes. It will describe the design approach for the flow control structures and how construction was implemented. The outcome has been a new, expanded wetland area, with improved amenity and ecological values, and with an increased ability to capture contaminants from urban stormwater runoff.

Grant Ockleston: Manager Stormwater Projects, Auckland City Council
e: grant.ockleston@aucklandcity.govt.nz

Graham Levy: Senior Associate, Water and Environment, Beca

TITLE: Recent projects by Peter Walker and Partners in The Auckland Region

This presentation from John Gundesen of Innovus (property development and management) and Orson Waldock (landscape architect with Isthmus Group) will give an overview of development projects being undertaken in the Auckland region with design input from Peter Walker and Partners, with particular reference to the planting projects associated with each project.

Peter Walker is considered one of the world’s most influential landscape architects. He has received international acclaim for his large-scale, environmentally-sensitive designs, including Millennium Parklands in Australia, IBM’s Solana campus in Texas and the Sony Centre in Berlin. He has been commissioned to design the landscape for New York’s Twin Towers site. He has recently been Chair of the Department of Landscape Architecture at the University of California; and previously held a Chair at Harvard’s Graduate School of Design.

The projects:

Highbrook is a 153 hectare greenfield business park development located in Manukau City, Auckland.

It is designed to accommodate approximately 550,000 metres of floor space and have a daytime employee population of 12,000.

Korowai Kakariki is a concept to establish a major landscape design along SH1 from Albany to Orewa. It has been initiated in response to the community’s desire to protect and define the Hibiscus Coast’s separation from urban Auckland.

The concept design responds to the existing and historic condition of the area; bush, rural farmland and grasslands.

It looks to use these elements to protect the existing views and rural character of the journey along this arterial road - thereby creating a unique landscape experience connecting the Hibiscus Coast with urban Auckland.

Western Reclamation: *Ports of Auckland is presently participating in the establishment of an overall vision for the waterfront with the ARC and ACC, and developing its plan for the northern end of the Western Reclamation.*

TITLE: Plants are the Infrastructure to Ecological and Cultural Integrity

The often bitter debate over the types and nature of plants in our cultural landscapes demonstrates how seriously society regards these green backdrops to our lives. Clearly there is greater meaning attached to the form, layout and origins of the trees, shrubs, herbaceous plants, grasses and weeds in our cities and countrysides than most people care to admit. Large council budgets are devoted to managing public parks and gardens and biosecurity in our towns, and nation-wide there is enormous input of resources into managing private lawns and other decorative or symbolic plant associations that adorn our urban gardens. We acknowledge that plants proscribe significant biodiversity, aesthetic, amenity, historic and cultural value. Change is inevitable and is increasingly (self-consciously) directed by some sectors of society rather than occurring spontaneously. Therefore rational and inclusive design and management steps need to be taken to accommodate the values that different sectoral groups ascribe to plants. Without this there will be an incoherent, even divisive and arrested culture and a perpetuation of decisions made by colonists over a century ago. The losers will be endemic wildlife (ecological integrity), the global community who wish to experience an authentic New Zealand, and ultimately New Zealand citizens who seek a mature, unique and diverse identity as symbolised in landscape design and who recognise the important role that plants have in knitting the infrastructure together.

We explore a sequence of logical steps that might inform a consultative process and subsequent decision-making about plant structural and functional roles. We believe that existing models of consultation do not address the divisions of opinion, nor ecological bottom lines and merely reinforce existing power elites and winner-take all decisions especially in key visible locations. The steps and criteria for determining plant priorities should include: 'pose no biosecurity risk', sustainability, valuable/essential to wildlife, provide amenity value; then establish appropriate site designs that relate to scale of site and other socially-desired roles, and establish landscape designs that provide for spatial connectivity. We finally present exemplars of indigenous and equivalent exotic structural species for different garden types and elements.

Colin D Meurk
Landcare Research, PO Box 69, Lincoln 8152
e. meurkc@landcareresearch.co.nz

Simon Swaffield
Lincoln University, Lincoln 8152
e. swaffies@lincoln.ac.nz

TITLE: Urban impervious/greenness maps derived from satellite imagery

Accurate, up-to-date maps of urban green space and impervious surfaces are important for planning and monitoring urban development. Such maps are needed for a number of applications, particularly design of stormwater systems, air quality modelling, and planning of urban green space layout for both recreation and wildlife habitat.

We investigated methods for mapping urban green space and impervious surfaces using multispectral satellite imagery of Christchurch City. Results were tested for accuracy against reasonably contemporaneous high resolution aerial photographs.

We mapped urban impervious surfaces and green space for the full area of Christchurch City, using imagery acquired in February 2000. To gain the best accuracy, we developed a suitable image processing method (using spectral pixel unmixing) for automated analysis of the satellite images. We then assessed the accuracy of the resulting impervious surface maps against the aerial photographs. For this accuracy assessment, we used 10 tiles of aerial photography, each covering 750 × 500 m, chosen to represent a range of urban land cover types.

Our full-city-coverage map was derived from medium resolution Landsat Thematic Mapper satellite imagery (pixel size 30 × 30 m). While higher resolution satellite imagery is now available, at a price, medium resolution imagery has been available since the mid-1980s and is thus able to provide information over a longer timeline.

Percent impervious surfaces within the test tile areas ranged from 47% to 55% for six different urban suburbs, 85% for the CBD, 71% for an industrial area, and 18% and

31% respectively for two residential areas on the urban fringe. Our method was able to quantify percent impervious surface with an error of not more than 12% in nine cases out of ten, on a whole-tile basis. The tenth test site was the industrial site where hard-packed subsoil and gravel were mis-classified as impervious in the satellite image (pervious in the reference data).

The main source of error was found to be the huge variation in "greenness" of live vegetation throughout the city, ranging from drought-stricken grass to lush trees and gardens. This led to a corresponding variation in quantification of the non-green component. Current research includes examination of spring (rather than summer) imagery to reduce this variability in the green vegetation spectral signature. We believe this should enable us to fulfil the requirement of the city for greenness:impervious mapping accuracy to be under 10% at a whole-suburb level. We have also worked with high resolution (4 × 4 m pixel size) satellite imagery and will continue mapping from such data sources for situations where post-2000 time series will suffice.

Stella Belliss and Heather North
Landcare Research, PO Box 69, Lincoln 8152
Corresponding author: e: bellissS@landcareresearch.co.nz

TITLE: Achieving Great Outcomes through Multi-discipline Teams

Delivering large complex projects involve the forming and leading of large teams from various disciplines and backgrounds. The success of the project and the level of outcomes delivered become increasing linked to how well the multi-discipline team creates a balanced performance based culture.

This not only involves the traditional skills of project management, but now needs to include wider aspects such as team culture management, opportunity & relationship management and project leadership. These success factors are relevant to all projects, irrespective of size and nature.

Key insights to this approach and the process of building, sustaining and leading successful multi-discipline teams have come from experiences on the Grafton Gully Project and numerous design build projects which the author has lead.

This presentation will cover the following:

- Delivering outcomes
- Defining project functionality and expectations
- Culture Management
- Project and team values
- Balanced decision making
- Managing risks and opportunities through relationships

Kim Barrett M.Eng.Sc, B.E (Hons), B.Com, M.IPENZ
Project Manager
Haydn & Rollett Construction
e: kbarrett@haydnrollett.co.nz

FRIDAY afternoon fieldtrip:

Cornwall Park

Cornwall Park is renowned for its landscape design and its wide variety of mature trees. It is centred on a volcanic cone, One Tree Hill, with many interesting geological features. A pre-European Maori fortification (pa) was built on the cone, many features of which can still be seen.

Cornwall Park has tree plantings dating back over the past 150 years. Austin Strong's design intended to protect the natural beauty of the landscape and provide open spaces for passive recreation. Although it was not until the 1920s that intensive planting of the Park began, the current practice is to follow the aims and objectives of Campbell's intention for the Park and elements of Strong's design features.

The park's donor, Sir John Logan Campbell, is buried on the summit of One Tree Hill alongside the obelisk. The Maori name for the hill is Maungakiekie - mountain of the kiekie. Kiekie (*Freycinettia banksii*) grows as an epiphytic climber or vine. Immediately adjacent to the Park is One Tree Hill Domain, administered by Auckland City Council.

The two parks are run under different management but with very similar objectives. Visitors can experience them as one park.

Waiaatarua Reserve

Auckland City has recently completed the construction of a wetland stormwater treatment system within the Waiaatarua Reserve, east Auckland. The 41ha reserve used to be home to a 22ha wetland formed around 9000 years ago when a volcanic eruption isolated the catchment from the sea.

The wetland was utilised by early Polynesian settlers as a source of food that was augmented by clearance of surrounding land for additional crops. Significant modification to the wetland occurred in the 1930s with the inclusion of drainage channels that reduced the wetland size to around 6ha. The channels and use of cattle for grassland and wetland margin maintenance impacted public amenity and resulted in much of its water purification and ecological value being lost.

Restoration of the wetland involved significant public consultation and was

FIELDTRIPS

constrained by the need for flood protection of neighbouring residential dwellings and challenging geology involving a thin surface crust underlain by as much as 8m of soft peat. In designing work, it was necessary to minimise the depth and extent of both excavation and filling, and design hydraulic control structures that did not require substantial stable foundations. Constructability was also a significant factor in both design and contract structure.

An introductory explanation of the project will be provided by Grant Ockleston from Auckland City and Brian Halstead, Landscape Architect before we visit the wetland site by bus.

Auckland Regional Botanic Garden

The Auckland Botanic Gardens covers 65 hectares of plant collections, native forest and gentle grassy slopes and is situated 15 minutes south of central Auckland, in Manurewa.

The grounds were farmland when purchased in 1967. Site development for the Botanic Gardens started in 1973 and were officially opened in 1982. Thus the

Gardens are fairly young, however their own distinctive character has flourished significantly in the last few years – and development constantly continues!

Managed by the Auckland Regional Council, the Gardens' main aim is being a spectacular South Pacific Botanic Gardens, with a major focus on displaying what will grow well within the Auckland area. The Gardens are developed and maintained by an enthusiastic team, lead by curator/manager Jack Hobbs and assisted by many volunteers; who together strive to meet this challenge. Jack will host us today in a brief tour of part of the gardens and then at Café Miko in the new visitor's centre.

Getting to the Gardens for the conference dinner from Auckland - Travel south on State Highway 1 (Southern Motorway): Take the Manurewa/Hill Road exit after Manukau City. Turn left into Hill Road and the main entrance to the Botanic Gardens is the 1st driveway on the left. One of the fieldtrip buses may return to Auckland for delegates not able to attend the dinner.

SATURDAY lunchtime fieldtrip:

Auckland University Plant Collections

The University grounds are home to a remarkable group of plant collections based on geographic regions. They represent the third largest tree collection of tree species in Auckland (Cliffin, P. 2001. *Tree Collections of Auckland: Biodiversity and Management*).

Today we will visit three parts of the collection, the NZ native collection around the Clock Tower of the Old Arts Building, the tree collection adjacent to Old Government house and the tropical collection beside the Law School Library.

Albert Park

Albert Park combines historic, recreational and botanical interests in its formal Victorian layout designed by competition in 1879, won by James Slater. It has an impressive collection of over one hundred species and cultivars of trees. We will have our picnic lunch in the band rotunda.

The park stands on the Symonds Street ridge, which was built up and broadened by a thick layer of ash that erupted 60,000 years ago from a volcano situated close to where Victoria Street East, Kitchener Street and Bowen Avenue meet. Rangipuke is the name for the papakainga (village) that flourished here up until the arrival of the Crown in 1840.

The site became a defense post when the Albert Barracks were built in 1845. Ironically Maori were employed to construct the defensive stone wall, during preparations for the invasion of the Waikato. When the army left, the site came

under the jurisdiction of the city improvement commissioners who set part aside as a public reserve and laid out the remaining land as streets and sections. In 1879 Auckland City Council took over the site and held a competition to find a suitable layout, which was won by an architect, James Slater.

By the 1880s most of the old barracks were cleared away, paths and gardens were established and the fountain, Albert Park House (formally the gardener's cottage) and other improvements were added.

Inner City Street Trees

Auckland City is home to over 65,000 street trees and these constitute over 300 different species and cultivars of trees.

In the inner city area there has been a lot of debate recently about the proposed removal of trees on Queen Street.

We will visit Queen Street and hear points of views on three key aspects of the debate: Vision (Christine Caughey), tree selection (Simon Cook) and streetscape design (Jan Woodhouse).

We will be collected from the Auckland City Civic buildings for the return trip to Unitec.

FIELDTRIPS

GREENING THE CITY:

Bringing Biodiversity Back into the Urban Environment

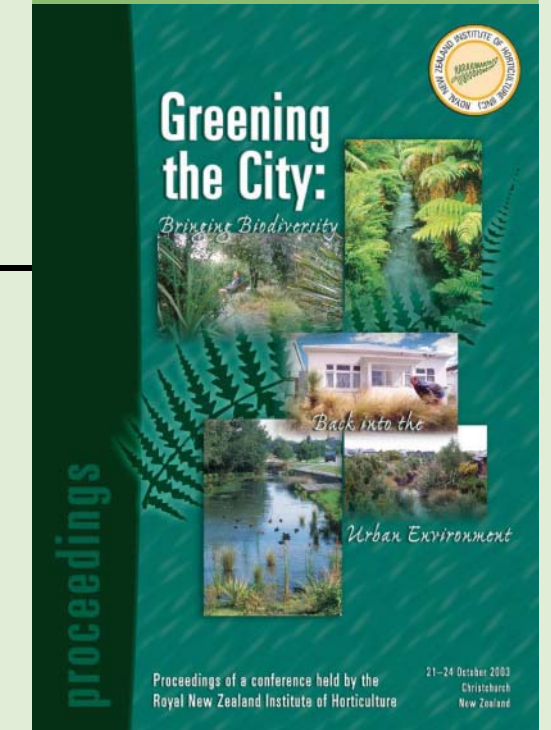
Proceedings of a conference held by the Royal New Zealand Institute of Horticulture in Christchurch, 21–24 October 2003.

These proceedings, edited by Murray Dawson and published late 2005, contain papers from a highly successful conference on urban biodiversity covering a broad range of topics including:

- *The important role of cities as a repository for biodiversity*
- *Social aspects of biodiversity in the urban environment*
- *Restoration and revegetation projects throughout New Zealand*
- *Trees in the urban environment*
- *Using plants to create healthy environments*

These proceedings will be relevant to a wide audience, including conservation groups and trusts, academics, ecologists, social scientists, students, conservation educators, horticulturists, landscape architects, town and city planners, greenspace managers, tangata whenua, and conservationists.

Thanks to a generous grant from the Canterbury Community Trust, we are able to offer this 310–page publication including colour plates at a heavily discounted rate.



To order your copy of the proceedings, please forward contact details, number of copies required, and remittance to:

The Royal New Zealand Institute of Horticulture, PO Box 12, Lincoln University, Canterbury, New Zealand.

New Zealand: NZ\$42.20 including p&p.

OVERSEAS:

Australia: NZ\$47.80 including p&p

Europe and USA: NZ\$58.80 including p&p.

SPECIAL \$30
If purchased during Conference