New Zealand Plant Conservation Network

CELEBRATING OUR NATIVE PLANT LIFE

Conference Proceedings

8-10 August 2008 • Te Papa Tongarewa, Wellington, New Zealand

Sponsored by Wellington and Hutt City Councils and the Department of Conservation
and supported by Enviroschools and Te Papa Tongarewa

www.nzpcn.org.nz

This publication is the proceedings of the NZ Plant Conservation Network conference held at the Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand from 6-7th August 2008. The workshop was organised by the New Zealand Plant Conservation Network, with sponsorship from Wellington and Hutt City Councils, the Department of Conservation and with support from Enviroschools and Te papa Tongarewa.

Cover photos (clockwise from bottom left): *Celmisia mackaui*, Hinewai 2007; *Anaphalioides bellidioides*; Cobden Beach, West Coast; basic outcrop on Mt. Herbert, Banks Peninsula, Canterbury; *Leptinella* sp.

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ISBN 978-0-473-14950-5

Publication designed by Cerulean • www.cerulean.co.nz

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EXECUTIVE SUMMARY

The fifth meeting of the New Zealand Plant Conservation Network was held from 8 - 10 August 2008 at Te Papa Tongarewa, Wellington, New Zealand. It was planned as a celebration of New Zealand's native plant life. It was also a chance to reflect on progress, since the Network's 2003 inaugural conference, towards New Zealand's implementation of the Global Strategy for Plant Conservation.

These proceedings provide abstracts and/or papers of presentations from the conference. They also include details of the workshop discussions and subsequent recommendations. These workshops were held to capture member's views on various aspects of plant conservation which were:

- In-situ protection of plant life
- Ex-situ management of plant life
- Plant promotion, advocacy and information
- Training and education
- Research

Key messages from the conference were that:

- Indigenous plants are still declining and more effective legal protection is needed
- Advocacy to territorial local authorities to ensure protection for threatened plant populations is critical
- The Network website is a nationally important resource and there are many ways that it could be improved (such as on-line forums and areas devoted to restoration and research)
- Delivering the marae-based plant training course should be a Network priority
- Seed bank collection milestones should be set
- The Network must advocate for plant conservation information to be included in new curricula (for both primary and secondary schools)
- Communication of research results from plant conservation work is vital

Conference attendees are listed at the end of this document.

INTRODUCTION AND BACKGROUND

The fifth meeting of the New Zealand Plant Conservation Network was held from 8 - 10 August 2008 at Te Papa Tongarewa, Wellington, New Zealand. It was planned as a celebration of New Zealand's native plant life.

The conference took place on the fifth anniversary of the Network's inaugural meeting on Saturday 2nd August 2003 at the same venue. It provided network members with an opportunity to meet and discuss the directions for the next 5 years and to hear papers on plant conservation science and practice. More than 120 people attended the conference representing plant nurseries, botanic gardens, universities and colleges, consultancies, zoos and museums, the Department of Conservation, territorial local authorities and botanical societies. More information about the Network may be found at http://www.nzpcn.org.nz.

PURPOSE OF THIS REPORT

These proceedings provide abstracts or papers from the presentations. They also include details of the workshop discussions and subsequent recommendations. Conference attendees are listed at the end of this document.

GLOBAL STRATEGY FOR PLANT CONSERVATION

Ratification of the Convention on Biological Diversity (CBD) in 1992 led to a realisation that the world's plant life was in a steady decline. A new global initiative was launched to address plant conservation led by Botanic Gardens Conservation International in collaboration with technical and professional bodies around the world.

The Global Strategy for Plant Conservation was the result and had sixteen targets to guide conservation of threatened species and ecosystems. The strategy recognises that effective, long-term conservation will involve a wide range of partners – governments, institutions, NGOs, and local communities.

The strategy has well-defined and achievable goals for integrated (*ex situ* and *in situ*) conservation of plant diversity, linked to targets for research, information management, public education and awareness to attain these goals. The Global Strategy for Plant Conservation may be obtained through the home page of the New Zealand Plant Conservation Network website (http://www.nzpcn.org.nz) or through the web site of the Botanic Gardens Conservation International (http://www.bgci.org.uk). The Network has been working to achieve these goals over the past 5 years.

ENVIROSCHOOLS NATIVE PLANT FORUM

As part of the Network conference a concurrent Native Plant Forum for Enviroschools was held on Friday 8 August. 80 children attended to take part in activities in Bush City and throughout Te Papa as well as having a weed swap (bringing in weeds to swap for native plants). The children also made presentations to the conference attendees during the poster session on Friday. This provided an opportunity for them to explain what plant conservation work they have undertaken at their respective schools. The Network worked with Enviroschools for over a year to plan and make the forum happen. Enviroschools is a wonderful organisation and the network thanks them for their support - in particular Karyn Burgess (the regional Enviroschools coordinator) who organised and ran the event.

Enviroschools waiting to receive their prizes

The Enviroschools Foundation

The Enviroschools Foundation is a charitable trust that provides support and strategic direction for a nation-wide environmental education programme. The Foundation comprises a governing trust board and small national management team based in Hamilton. The Enviroschools concept was developed in the Waikato in the 1990s, it has since been extended into schools across New Zealand. Implementation is on a regional basis, along regional council boundaries. The national team works with Enviroschools Regional Coordinators to support the creation of sustainable schools via:

Pukerua Bay school - working to save the Whitakers skink

- The *Facilitated Enviroschools Programme* - where schools sign-up to a 3-year process of environmental learning and action; as an enviroschool they gain access to an extensive resource kit and a trained facilitator.
- The *Enviroschools Awards Scheme* - an incentive scheme for schools to become actively involved in environmental education through achieving bronze, silver and green/gold levels with the assistance of an awards booklet.

From the outset Enviroschools had adopted a collaborative approach, building relationships to support and enhance existing environmental education initiatives. For more information about Envirochools go to http://www.enviroschools.org.nz

TANE NGAHERE LECTURE

Brian Molloy delivered the inaugural Tane Ngahere lecture on Friday 8 August 2008. Tane Ngahere is the *Father of the Forest* and one can consider Brian Molloy as the *Father of New Zealand Plant Conservation*. Dr Molloy was one of the men who inspired the late David Given to take an interest in threatened plants and New Zealand plant conservation issues. He has also played pivotal roles in the careers of many of our key botanists including Dr(s) Peter Heenan and Peter de Lange. A keen collector and noted mountaineer Brian has discovered many new species and has the distinction of having a genus named after him - an elusive orchid Molloybas.

Most recently Brian has been involved in the Queen Elizabeth Trust where he has worked as science advisor, Chair and Director of the Board and now as a noted regional representative. Never afraid of taking on the hard tasks Brian remains a much respected voice and at times necessary critic on the conservation movement. He remains deeply respected on both sides of the conservation fence. Farmers have his ear as do key Government departments. In 2006 the NZPCN recognised Brian's remarkable achievements with a Lifetime Achievement award.

2008 CONFERENCE INTRODUCTION BY THE PRESIDENT

Professor Ian Spellerberg

On behalf of the Council of the New Zealand Plant Conservation Network, it is indeed my great pleasure to welcome you all here today at the start of the 2008 New Zealand Plant Conservation Network Conference.

So, welcome to you all. I would like to extend a very special welcome to the Enviroschools and to extend my personal thanks to Karyn Burgess (the Wellington Enviroschools organiser) for kindly agreeing to take part in this Conference. I also wish to thank our sponsors (Wellington City Council, Department of Conservation, Hutt City Council, and the Wellington Botanical Society). I must, in particular, mention Jill Broom (Hutt City Council) because she kindly provided the attractive array of plants that you now see in this venue. Many, many thanks also to the Conference planning teams who have put in so much work over the last few months to make this a very attractive and worthwhile event.

Five years ago, in this very room, on Saturday August 2nd 2003, a group of like minded people (including myself) attended the inaugural meeting of the New Zealand Plant Conservation Network. The fact that such a gathering took place was surely an acknowledgement that throughout New Zealand there was a network of people who were dedicated to plant conservation. Throughout New Zealand there are indeed many people who, in their own way, are making a big difference to plant conservation. A network indeed, and such networks are there to help support each other and help to consolidate efforts. On that weekend, five years ago, that group of people contributed to workshops that attempted to identify priorities for plant conservation in New Zealand. A framework for those discussions were the 16 targets in the Global Strategy for Plant Conservation. The completion date for the targets is 2010.

In five short years, the Network has achieved a great deal and probably far more than any one of us could have dreamed of at that time in 2003. We will hear more about these achievements later in the Programme. I would just like to mention again that the strength of the Network lies in its membership. It is a network of diverse people undertaking an equally diverse array of work, projects and research. All of this and everyone is essential for plant conservation. The number of people here today, the presence of Enviroschool, the content of the Conference Programme, all of this is testament that plant conservation is alive and well.

However, in my opinion, never before, has there been such a need for greater efforts in plant conservation both here in New Zealand and though-out the World.

We live in turbulent times! There are great changes happening in the financial world. There are social and cultural changes and of course there is a nature crisis. The in word is the 's' word, that is 'sustainability'. However, the significance of the nature crisis is becoming overshadowed by concern about economics and development and financial instability.

Throughout the next three days I urge you all to be very aware that the next few years will bring many more threats and challenges to our native flora, to our natural heritage (the fundamental basis for sustainability).

For example:

1. Botanical and conservation research is already under resourced and under-funded. This trend is likely to continue!
2. That fundamental importance of taxonomy and systematics in education and in practice is already grossly underestimated.
3. Native plants and plant communities are scarcely mentioned in the curriculum.

4. The value of our native plants and native plant communities is not well recognised, whether it be the intrinsic values or the material values.

5. Plant conservation projects will become more and more difficult to resource.

6. Native plants and plant communities will become even more threatened, and there is a considerable risk that there will be more and more examples of damage and destruction.

7. There is no legal protection for individual plant species in New Zealand, this is in contrast to some other countries.

As you take part in this Conference, the skills and knowledge and enthusiasm and commitment to plant conservation will be evident amongst all who are here. However that will not be enough - not enough! To ensure that the very fundamental basis of sustainability (that is plants) is well managed and conserved, the New Zealand Plant Conservation Network needs to grow. Grow it shall. At the same time the Network has to ensure that the value and importance of native plants and native plant communities is widely recognised and acknowledged throughout the highest levels of government.

Please bare this in mind during the conference. In the next three days, learn lots, be motivated, and enjoy, and thereafter promise to be bold and have the courage to celebrate and be strong advocates for our natural heritage, that is our native plants and plant communities.

INVESTIGATIONS INTO THE FOOD VALUE OF BRACKEN FERN RHIZOMES

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Figure 1: Frond of *Pteridium esculentum*
Photo: Jeremy Rolfe

Pteridium esculentum (Forst. f.) Cockayne rhizomes were an important food source for pre-contact Māori in Aotearoa/New Zealand as described by Sir Joseph Banks and other early European visitors. De Surville wrote this about Māori he observed, "They eat a lot of fish and the only bread I have seen them with is made of fern root". Bracken fern rhizomes, aruhe in Māori were a dietary staple that was obtainable all year round while other foods were only available in certain seasons. Aruhe is often referred to in proverbs and song as '*te tutanga te unuhia*' – the portion which cannot be taken away. Our investigations into the productive capacity of the pre-European kūmara cultivar, 'Taputini' in the Cook Strait region supports the view that after kūmara were stored overwinter and planted out again by November there was very little kūmara left for consumption resulting in a carbohydrate shortage during the summer leading to increased reliance on the consumption of bracken fern rhizomes.

Preliminary results of investigation at Te Kopi in Palliser Bay into the yield for effort obtainable from harvesting bracken fern rhizomes show that it takes on average 96 minutes to harvest one square metre of rhizome and 370 minutes to sort, roast, remove the bark and scrape the farina (starchy component) from the rhizome fibres. The mean raw harvest weight from one square metre is 8648g which after sorting and drying for nine days results in 5033g of useable rhizome. 18- 20% of this is eatable after processing, producing 977kcal/m^2 which is more than the average of 929kcal/m^2 obtainable from experimental kūmara gardens. Preliminary toxicity results yet to be fully analysed show traditional post harvest treatments do little to minimise the toxic effects of the carcinogen, ptaquiloside, present in the rhizomes. However the farina portion does appear less toxic. Economies of scale resulting from burning areas of bracken fern prior to harvesting and from extracting farina by chewing indicate bracken fern rhizomes can provide a valuable albeit potentially carcinogenic source of carbohydrate.

A PLANT ON THE EDGE - THE TRIALS OF COASTAL PEPPERCRESS RECOVERY

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Aspects of the history, ecology and recovery management of *Lepidium banksii* (coastal peppercress) are covered in this presentation. Coastal peppercress was first collected by Dumont D'Urville in 1827 from the Abel Tasman coast, Nelson and Queen Charlotte Sound, Marlborough. It was formally described by Thomas Kirk in 1899 with scant material, but its taxonomic distinctiveness from Cook's scurvy grass (*L. oleraceum*) has only recently been confirmed. Coastal peppercress is a short-lived, semi-wood perennial which often dies down to a persistent root stock over winter. Healthy plants produce copious seed over several months of the year. Flowers are self-fertile and seed viability is high for at least one year but declines to low viability by 3 years.

Figure 1: Coastal peppercress – *Lepidium banksii*
Photo: Simon Walls

Coastal peppercress is typical of 9 of the 15 species of *Lepidium* native to New Zealand in that it is a threatened, coastal, regional endemic. Since its discovery 180 years ago it has been recorded from only 9 localities, all in the northern South Island between the Abel Tasman coast and Queen Charlotte Sound. It is confined to a narrow maritime zone between high tide and coastal woody vegetation, often in association with nest and roost sites of seabirds, including gulls, shags, terns and penguins. Nutrients and disturbance provided by seabirds is strongly correlated with peppercress presence, persistence and health.

Coastal peppercress has a national threat ranking of Nationally Critical and is one of 11 species included in the national coastal cresses recovery plan. This plan has guided the Department of Conservation in the recovery management of this species. A survey of all known localities in 1990 confirmed 42 individuals at two sites. A third site of 500 individuals was found a year later, but all were eradicated by pig rooting within 2 years of discovery. No new populations have been found since.

Other identified biotic threats to peppercress include adventive weed competition, infection by white rust (*Albugo candida*), and herbivory by white cabbage caterpillar, diamond back moth, grey aphid, rodents, hare and rabbit, possum, deer and, especially in cultivation, slugs and snails. Negative impact on coastal peppercress by stoat predation of sea bird populations is also implicated. Known abiotic threats include drought, storm surges and landslides. Threats usually occur in combination and are often fatal to peppercress.

Threat mitigation initiatives over 20 years include regular applications of selective insecticides, fungicide and herbicides to most populations. Several hundred cultivated plants have been translocated to 21 new sites in Tasman Bay and Pelorus Sound, with priority given to naturally functioning ecosystems with seabirds, free of mammalian browsers and predators. New habitat has been created by eradication of rabbits from Moutere Islets, mice from Adele and Fisherman's Islands, and undertaking habitat plantings where necessary. Creation of small coastal terraces by construction of dry rock walls has also successfully provided novel sites for establishment of new populations. Currently, the total number of individuals for this species is 113 at 10 sites.

VIRUSES IN NATIVE FLORAS: THREATS TO BIODIVERSITY OR PART OF BIODIVERSITY?

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More than half the world's species use other organisms as their habitat. Viruses are perhaps the ultimate parasites: they are simple packages containing one or a small number of genes which instruct their host to manufacture more virus particles. The consequences of virus replication range from debilitating disease and death of the host to latent infection which may have no detectable effect on the host. Over 900 plant viruses have been characterized to date and while most of these have been studied in agricultural systems some are known from natural ecosystems. Some of these viruses are a natural part of biodiversity and, like it or not, should be conserved. Some, like weeds or introduced pests, have invaded native species and pose a threat to biodiversity.

Figure 1: *Turnip yellow mosaic virus* infection of *Cardamine robusta* (formerly *C. lilacina* 'robust alpine variant')

Plant pathologists and others have a romantic notion that diseases are controlled in *natural* ecosystems and that we only see high incidence of disease in crops and other artificial ecosystems. There is little factual information to support or refute this notion. My interest is to discover these pathosystems involving native floras and to compare them to agricultural systems. We have unique opportunities to study natural and agricultural ecosystems in Australasia. All our major crop and improved-pasture species have been introduced during the last 200 years and their complement of pests and pathogens has been steadily accumulating since this time.

In 1980 I found *Turnip yellow mosaic virus* infecting *Cardamine robusta* a rare, but not endangered, endemic brassica from the Kosciuszko alpine area (figure 1). At 2 sites up to 40% of plants showed a bright yellow mosaic in their leaves (Guy and Gibbs 1985). During the course of a number of ecological and molecular studies of this pathosystem a new virus, *Cardamine chlorotic fleck virus* and the rust *Puccinia cruciferarum* were found infecting *C. robusta* (Gibbs *et al.* 1986). Lower altitude *Cardamine* spp were infected with an unidentified Carlavirus. In 10 years fewer than a dozen people, with very modest levels of funding, had documented four pathogens from a diminutive genus of no threat or use to agriculture.

Populations of *Desmodium* spp. and *Kennedya rubicunda* have been surveyed for *Kennedya yellow mosaic virus* an endemic virus which has been isolated from these woodland creepers the length of the east Australian seaboard. All isolates of KYMV cause conspicuous mosaic symptoms and virus incidence was around 70% in the populations sampled. Both of these examples counter the idea that diseases are inconspicuous and of no consequence in native species. If a brassica crop had disease incidences of 40% or a legume crop had 70% infection a farmer would be considering whether it was economic to continue cultivation or to just cut their losses and try again next season.

A number of virus-like diseases have been found in woody species from the New Zealand flora but, to date, they have been impossible to characterize. Newer molecular techniques are speeding up the processes of detecting and characterizing viruses so hopefully by the next meeting we will know a lot more about them.

Some of New Zealand's introduced viruses have invaded the native flora. All of the invading viruses are generalists which infect a large number of species and are transmitted by introduced aphid species. *Cucumber mosaic virus* has the widest host range for any plant virus, including more than 1200 species in over 100 families of dicots and monocots. It causes serious disease in cucumber and tomato, capsicum and banana. In New Zealand it has invaded karaka, Chatham Island forget-me-not, *Clematis paniculata* and our only native cucurbit *Sicyos australis* (Pearson et al. 2006). Together with two other viruses, *Zucchini yellow mosaic virus* and *Watermelon mosaic virus*, CMV has been implicated in the decline of this rare and endangered species (Delmiglio and Pearson 2006).

The introduced barley yellow dwarf viruses (BYDVs) have invaded native grasses in New Zealand. Virus incidence was significantly lower in the native species (2%) than in the introduced species (12%). Although incidences were generally low at most sites exceptions occurred. At two separate sites 20 and 30% of tillers collected from *Lachnagrostis pilosa* and *Festuca multinodis* tussocks, respectively, were infected with BYDV. Four different serotypes (RMV, RPV, PAV, MAV) were detected in the introduced grass flora but only two (RMV, PAV) were detected in native species. In experimental transmission tests the aphid vector *Rhopalosiphum padi's* survival was variable on the 20 native species tested but this was not due to the presence or absence of endophytic fungi as none were detected in the New Zealand species. Aphid numbers increased and plants were killed when *R. padi* fed on *Agrostis muelleriana* and *Festuca multinodis*. *R. padi* transmitted a PAV isolate to these and six other native species.

BYDVs infected 4/5 of the subfamilies tested. Virus incidence in native Arundinoideae and Pooideae was significantly lower than in introduced Pooideae and Panicoideae. One species of Bambusoideae collected from the field was not infected but was found susceptible in glasshouse tests. *Agrostis capillaris*, *Dactylis glomerata and Lolium perenne* were identified as the most likely reservoirs of infection for the native flora. *Anthoxanthum odoratum* was not infected but if the SGV serotype and its vector *Schizaphis graminum* were ever introduced into New Zealand, *A. odoratum* could form an effective reservoir from near sea level into alpine areas (Davis and Guy 2001).

Cocksfoot mottle virus, previously considered to have a natural host range restricted to cocksfoot and wheat was detected in *Poa anceps*, *P. cita*, *Festuca novae-zelandiae* and *Chionochloa rubra*. High incidence of this virus in native grasses on the Central Volcanic Plateau was attributed to military activity. It seems that tank and troop activities are spreading the virus (Delmiglio et al. 2009)!

Conclusion

Plant viruses are a part of biodiversity. When we talk of conserving plant communities we are also considering the conservation of these plants' pests and pathogens. We have a lot to learn about plant viruses in the wild and they have a lot to teach us about how hosts coexist with their pathogens. Preserving these pathosystems is another reason why we need national parks and other protected areas as information on these systems will give us a new perspective on how we control disease in agricultural systems.

Plant viruses are a threat to biodiversity. Like other introduced pests some viruses have the potential to threaten the survival of plant species. Our strict biosecurity policy is focused on preventing the incursion of pests and diseases in an effort to protect our agriculturally based economy. An added benefit of this security is the exclusion of species which harbour viruses and pests which could transmit these agents to the native flora.

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GENETICS AND CONSERVATION

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There have been few genetic studies of endangered plant species in New Zealand. We aim to address this by producing genetic information that can be directly applied to recovery programmes. The Sustaining and Restoring Biodiversity (SARB) outcome based investment (OBI) lead by Landcare Research is addressing this problem. By using genetic tools to better understand population viability we can better manage populations at risk of extinction from genetic effects. We have selected several species for genetic studies and used a range of markers to best identify the best practice for population conservation.

Lepidium oleraceum genetic diversity has been studied using microsatellite markers. The Chatham Islands and Otago Peninsula are the centres of diversity for this species and likely to be of the greatest conservation value. North Island and northern South Island populations had limited diversity. The Banks Peninsula remnant population is genetically similar to some of the material from the Chatham islands. This information will be used for the conservation management of this species.

Our study of *Olearia gardneri* (Gardner's tree daisy) is quite unique in that we have managed almost complete enumeration of the species with only very small individuals, where it would threaten survivability, not sampled. We found that there was considerable variation in the largest population, but smaller populations have limited variation. Due to the possibility of self incompatibility and limited recruitment at most sites, it would seem that transplants between populations to possibly restore compatibility between individuals in population with limited variation may be the best conservation strategy.

There has been reluctance to translocate plants from other sites for restoration plantings. This has been based on the avoidance of outcrossing depression and is commonly termed eco-sourcing. While the idea of eco-sourcing may be acceptable in species where genetic health isn't already compromised in species under direct genetic threats to extinction the application of these ideas can be counter-productive.

THE NEW ZEALAND THREAT CLASSIFICATION SYSTEM AND THREATENED VASCULAR FLORA, TRENDS FOR THE FUTURE?

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In 1993 a New Zealand vascular plant threat listing was first undertaken by a committee appointed by the New Zealand Botanical Society and funded by the Department of Conservation. Initially listings of vascular plants were undertaken using the IUCN Red List Threat Categories. However, it was soon discovered that these categories tended to grossly overstate threat. In particular they failed to take into consideration naturally uncommon, narrow-range endemics, which are a feature of most insular systems. This confusion resulted in conservation managers assuming that such species required conservation management, to the potential detriment of other genuinely threatened taxa. Further, the IUCN system had no recovery pathway, meaning that taxa whose conservation status was improving could only ever be listed in a lower threat category. In 1998 a New Zealand based scheme was published whereby the flora could be partitioned in to "Threatened", "Declining", "Recovering" and "Naturally Uncommon" categories. It was trialled in 1999. That system applied well to plants but the categories lacked criteria, and so assessments were still subjective, and it could not be easily applied to other life forms.

The Department of Conservation was petitioned to consider the collaborative development of a New Zealand based threat system. In 2002 such a system was devised, departing from the 1998 scheme in that it was applicable to all biota and each category had criteria. That system, "The New Zealand Threat Classification System" was employed by the Department of Conservation for two listings, after which it was reviewed. The main criticisms were that there was no recovery pathway, the criteria for the categories was at times too conservative, that there was substantial overlap between "Chronically Threatened/Serious Decline" and "Acutely Threatened/Vulnerable", and that the categories "At Risk/Range Restricted" and "At Risk/Sparse" were not mutually exclusive. Following a major review, a second iteration of the New Zealand Threat Classification System was published in 2008. This iteration has a life span of 10 years, and departs from the 2002 version by the reinstatement of "Naturally Uncommon" and "Declining" categories within a modified "At Risk" super category, development of a recovery pathway, and creation of a new category "At Risk/Relict".

The manner in which the listing process is undertaken and how the results are published has also changed to remove the public perception that the system was exclusively owned and so influenced by government departments. During November 2007 the New Zealand Threatened Vascular Plant panel met and reassessed the indigenous vascular flora using the revised system (then in press). A total of 2357 formally named taxa and 600 informally recognised entities were run through the system in three days. A total of 587 submissions on plants were received from the New Zealand public. This resulted in 896 taxa (or 38% of the indigenous vascular flora) being listed by the system. Of this figure, 179 taxa are listed as "Threatened", 649 as "At Risk", 26 as "Non-Resident Native" and 36 are regarded as "Data Deficient". A further 171 informally recognised entities are also listed separately by threat. This listing is seen as providing some guidance as to those unnamed entities seen as urgent conservation priorities for biosystematists to resolve.

Forty-four taxa and 26 informally recognised entities previously regarded as threatened were removed from the lists because they are either regarded as no longer "Threatened", "At Risk", or their taxonomic status has been resolved. There has been an increase of 57 (32%) taxa listed as "Threatened" since the last listing was published in 2004. This increase mostly reflects a worsening situation, especially in the drier, intermontane basins of the eastern South Island, where a shift from mainly sheep and mixed cattle-sheep farming to dairying is threatening a range of habitats once believed relatively secure. Another factor has been an increase in the numbers of new taxa being formally described that are also regarded as "Threatened". Since 2004 there have 17 taxa described

that warrant listing, about half of these are plants first recognised as potentially distinct, in some cases up to 40 years ago, and which have only just been formally described. However, the rest are genuine new discoveries, often of large tree species, demonstrating that our flora is still inadequately studied even at that level. Some gains also stem from an improvement in information received by the plant panel. Species-specific field surveys have helped resolve the status of many taxa formally regarded as "Data Deficient", and most of these are now known to be "Threatened".

It is concluded that our flora is becoming increasingly vulnerable to extinction, especially in key habitat types, and that without full legal protection of our indigenous flora New Zealanders stand to lose much of their flora within the next 20 years. Some species including several yet to be formally recognised by biosystematists are now perilously close to extinction and for many of these, management is difficult as they occur on private land.

TAXONOMY AND SPECIES LIMITS IN THE AUSTRALASIAN SNOW HEBES

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The southern hemisphere hebes (*Veronica,* Plantaginaceae) are the largest and arguably the most fascinating flowering plant radiation in New Zealand, comprising ca. 120 species ranging from tiny herbs to small trees that are found in a variety of habitats and elevations. The snow hebes, formerly comprising the genus *Chionohebe,* are included in this group and consist of five species of cushions or small subshrubs that occur exclusively in high elevation habitats of Australia and the South Island of New Zealand. Species delimitation among the cushion snow hebes is very difficult due to the reduced pulvinate habit, solitary flowers, and few gross morphological characters useful for identification. To address species limits, investigate intraspecific patterns, and revise the taxonomy of the snow hebes, morphological analyses were conducted and the results compared with previously published molecular phylogenetic data. In this talk, I will specifically address whether Australian snow hebes are conspecific with their New Zealand counterparts, how many cushion species should be recognized, and to what extent several types of data (i.e., molecular, morphological, ecological) can be integrated regarding snow hebe species delimitation.

Figure 1: *Chionohebe myosotoides*
Photo: John Smith-Dodsworth

CONSERVATION GENETICS OF *PSEUDOPANAX*

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Because they can assess numerous characters, analyses of DNA variation can be very powerful, and they can be used to assist conservation outcomes in a number of ways. For instance, the appropriate delimitation of biodiversity into (relatively) discrete units, whose threatened-status can then be individually assessed, is a necessary precursor for prioritising conservation resources. In *Pseudopanax*, we are using AFLP DNA-fingerprinting in conjunction with morphological analyses to assess the taxonomic status of *P. lessonii*-like plants initially recognised from the Surville Cliffs area. These plants typically are low-growing and have trifoliolate leaves. Preliminary analyses of genetic and morphological data are congruent in suggesting that these plants are not confined to the Surville Cliffs, but are more widespread on the Aupouri Peninsula, and are therefore not as rare as originally thought.

Figure 1: Juvenile foliage of *Pseudopanax ferox*
Photo: Jeremy Rolfe

Another use of conservation genetics is to assess the genetic 'connectivity' between populations. Geographic structuring of both neutral and adaptive genetic variation has been demonstrated within New Zealand plant species. This emphasises the importance of local 'eco-sourcing' for restoration projects; otherwise, unseen but natural patterns of genetic variation are likely to be distorted or destroyed. However, we still know little about the locations, or even existence, of genetic 'hotspots' (regions with high genetic variation), or about the geographic scale of genetic variation; such knowledge is necessary to better understand the historical and/or contemporary dynamics of populations. In preliminary genetic analyses of *Pseudopanax ferox*, we can distinguish southern/central South Island populations, northern, and southern North Island populations from one another, but we cannot, as yet, distinguish amongst the southern/central South Island populations.

Conservation genetics can also be applied to address specific management questions. For example, it has been suggested that some northern populations of *Pseudopanax ferox* may be threatened by hybridisation with *P. lessonii*. However, the hybrid individuals at these sites may simply be the common and widespread *P. crassifolius* × *lessonii*. Although it may be difficult to separate these two hybrid combinations by morphology, we can easily distinguish the three species genetically. Therefore, DNA analyses could be used to quantify the genetic threat to these northern *P. ferox* populations; if it is actually low, conservation management will be able to focus on demographic and ecological issues without having to somehow control the promiscuity of the plants.

CONSERVING OUR SMALL-LEAVED TREE DAISIES

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Introduction

The Department of Conservation's small-leaved tree daisy (*Olearia*) recovery group is concerned with the conservation of eight *Olearia* species. These are *Olearia adenocarpa, O. gardneri, O. polita, O. hectorii, O. fimbriata, O. fragrantissima, O. lineata* and *O. quinquevulnera*. These species share several common features which include small leaf size, being long lived shrubs or small trees. In addition some are deciduous and others have scented flowers. They often share the same habitat and so are subject to the same threats. They are colonising species requiring high light levels and generally rely on disturbance for recruitment. Although some are localised in their distribution some have an overlapping distribution. Up to three species may co-occur at a site.

They sometimes occur in threatened habitats and often share their habitat with other threatened species. Riparian forest is a threatened habitat where some of these *Olearia* species are found sometimes co-associated with several other threatened plants. In addition some are hosts to threatened moth species. Brian Patrick has studied the associated moth fauna and this needs to be considered in their conservation management.

Threats

Scientific knowledge of these tree daisies has grown considerably, however their appreciation by landowners and the public remains poor. The lack of awareness of the plants and their plight represents a threat to them. They are generally found within a farming landscape and habitat loss has been a major factor in their decline. Habitat loss has been greatest in lowland sites with fertile soils, especially valley floors, riparian sites and toe slopes. Farming practise can be a threat, indeed when *O. adenocarpa* was discovered most plants were browsed to an extent they were non reproductive. Many populations are small and have become fragmented, which may affect reproduction. Habitat modification has resulted in increased weed and pest animal impacts. Sites often have a skewed population status with mainly old or senescent plants and few young plants. *Modification of habitat often results in reduced regeneration capacity.* Those factors that affect reproduction impact upon their long term survival.

Recovery Group

The recovery group includes the leader and five reporting members (who oversee management of the major populations for most species) and two scientific advisors. Prior to forming the recovery group these *Olearia* species were not well known. Most species were new to the threatened plant list and some newly described species. Information was required to prioritise sites for protection and restoration. Initial work concentrated on survey, establishing habitat requirements/ecology and research requirements. A successful funding bid in 2000 allowed much additional work to be achieved.

Survey

Survey has been a major recovery group effort. There have been many surveys undertaken. Some have been funded through the Department of Conservation's biodiversity funding project. Other surveys have been undertaken as a result of local Department of Conservation initiatives, Tenure Review and other high country work, associated with research and by other interested persons/groups. Surveys are primarily to find new populations, however they also allow known populations to be more accurately determined, to better assess the population status and potential management requirements. Survey has improved our knowledge of all the species. Much survey work

has been undertaken on private and pastoral lease land. There has been some controversy with access denied in occasional cases.

Protection

There is still a lack of protection for most of the species, with few legally or physically protected sites, especially at low altitudes. Most sites occur on private land which is generally farm land. Four species (including some important sites for these), occur on pastoral leases. Tenure review has resulted in the protection of some sites and it is hoped that additional sites will be protected in the future.

Case study - *Olearia hectorii*

The total population is approximately 4500 plants known from c. 90 sites. About two thirds of the total population is known from the nine largest sites, however most sites contain small numbers of plants. Of the nine largest sites only two are legally protected.

Place	No of plants	Land Tenure
Chalk Range (S. Marlborough)	2000	Private Land
Cameron Flat (Wanaka)	300(#)	Pastoral Lease
Waikaia Valley (N. Southland)	300+	Pastoral Lease
Pomahaka (W. Otago)	150	Private Land
Puhi Stream (S. Marlborough	150	Private Land
Stoney Creek (Southland)	138	Private Land
Craigmore (S. Canterbury)	c.100	QEII Covenant
Motatapu (Wanaka)	c.100 (#)	Conservation Area (ex Pastoral Lease)
Wairepo (Catlins)	c.100	Private Land

total Matukituki population 700 plants

Research

There have been several key publications on the taxonomy, ecology and conservation of these species in recent years. One important piece of research has been Peter Heenan's self-incompatibility work on *O. adenocarpa*. Peter undertook controlled self and cross pollination trials. It was found that some are genotypes are self-incompatible, while others are to some degree self-compatible. Self-incompatibility decreases inbreeding and ensures out-crossing. Small populations which exhibit this trait could be vulnerable to a loss of reproductive viability. There was also evidence of inbreeding depression. Do other species have the same breeding system? *O. gardneri* and *O. hectorii* plants are being grown in cultivation for future research.

Peter Heenan has produced a research discussion document for the recovery group. Key points within this are:

- Understanding levels of genetic diversity is essential for knowing what we are trying to conserve and identifying genetically important populations.
- Knowing how the breeding system operates and what pollinators are involved is critical to the management of the species because seed set is essential for recruitment to occur.
- It is necessary to understand both the levels of genetic diversity and breeding systems prior to developing a successful conservation management strategy

- This research will provide guidance regarding site population restoration targets, sources of material and amounts of mixing required to maximise genetic diversity in a population.

The research has raised some management implications including:

- What is the minimum population size to maintain sufficient genetic diversity? We think probably 50 plants. This is important as many populations are very small and may require boosting. It will also influence targets of restoration programmes.
- If we need to mix plants from different sites, then how far should we transport plant material? To date plant material has generally been sourced from within an individual restoration sites.

Restoration

Several restoration projects underway involving most of the species and all major conservancies. Many of these projects involve habitat restoration with a range of threatened species. Restoration will be a key focus for the future. Information on disturbance regimes may identify the best opportunities for natural recruitment, this may be more important than population size in selecting sites for long term management. However many considerations, including ownership, site protection and genetic variability need to be considered. Also what about the associated threatened moth fauna?

Achieving natural recruitment is an objective of restoration initiatives. Generally abundant seed is produced; however there is a lack of natural recruitment. Seeds need suitable establishment sites. Often exotic grass swards prevent germination. Many sites have even aged stands which are thought to have established following disturbance events. Restoration initiatives could involve mimicking disturbance events to create suitable sites.

Recruitment trials have been undertaken at a range of sites. Initial trials were in the Hautapu Valley and Chalk Range and more recently in the Catlins, Matukituki Valley and Southland Plains. These trials involve the removal of vegetation with broad spectrum herbicide. Seedling germination has been achieved though is variable. The best results were up to 4675 per square metre. Some of the key findings include:

- The timing of spraying is critical to ensure the grass sward has sufficiently died down to give bare ground before seedfall.
- Need bare surface, therefore dense thatch may need to be removed.
- Soil disturbance triggers weed germination.
- Spraying of grasses can result in an increase in herbaceous weeds which are more difficult to control. Also chemical control of herbaceous weeds will kill *Olearia* seedlings.
- Weed re-growth problematic especially in wet climates.
- Bare ground attracts rabbits.
- Seedling growth rates variable.
- Recruitment (i.e. self-sufficient seedlings) achieved at some sites.
- Some germination of associated species
- Monitoring needs to be improved however this is more labour intensive.

The initial work has provided some positive results and show much potential, however more trials are needed! These trials need to be repeated over time to have better idea of seasonal site variation and reasons for this. Trials could also test germination success with increasing distance from the seed source, other chemicals and a wider range of sites.

Advocacy

Landowners are a key stakeholder as most plants are on private land, generally farmland. Also the plants remain relatively poorly known by both landowners and the general public. Therefore providing information/advice is important. A key output has been the production of fact sheets for seven of the species (these are available on both the New Zealand Plant Conservation Network and Department of Conservation websites). In addition they have been a focus of talks to public groups, field days and consultation with iwi.

The future

Landowners remain the key stakeholder. It is important to increasing the number of partnerships and individuals/groups involved in their conservation. More restoration initiatives are needed and should take a greater advantage of the large numbers of riparian plantings being undertaken. However there is still a need for increased advocacy of these plants and their plight, as well as increased knowledge of their ecology and restoration requirements. Despite much progress much having been made, more needs to be done to ensure they do not continue to decline.

Figure 1: *Olearia hectori* flowers
Photo: John Barkla

Figure 2: *Olearia hectori* tree
Photo: John Barkla

WHERE NEXT FOR THE NEW ZEALAND PLANT CONSERVATION NETWORK?

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Introduction

The vision of the New Zealand Plant Conservation Network *is that no indigenous species of plant will become extinct nor be placed at risk of extinction as a result of human action or indifference, and that the rich, diverse and unique plant life of New Zealand will be recognised, cherished and restored.* This places a great weight on our effectiveness at protecting individual populations of threatened species and their communities. The Network chose *Trilepidea adamsii* - the presumed extinct Loranthaceous mistletoe- as its logo to act as a constant reminder that extinction is forever. The Network now services the needs of more than 500 members reflecting the widest possible constituency of plant conservation scientists and practitioners in New Zealand but what has it achieved and what does it still need to do?

Figure 1: Janeen Collings from the Department of Conservation working with students from Ngati Hine at marae based plant training course in Northland

Figure 2: Rangitaane (in whose rohe the seed bank is situated) blessing the seed in front of the children from Newbury School

Figure 3: Kanuka forest aerially sprayed with herbicide by landower in the Wairarapa

Achievements

The Network's greatest achievement is probably the establishment of a website (http://www.nzpcn.org.nz) developed with assistance from the Government's Terrestrial and Freshwater Biodiversity Information System fund (TFBIS). This is the most visited plant website in New Zealand and one of the most visited in the world. It is currently receiving more than half a million visits each year. The site has fact sheets for all indigenous and naturalised plants and for most threatened fungi, mosses, liverworts and lichen. It also has more than 2,000 plant lists including all Tony Druce's collection. Links have been added from each fact sheet to national distribution maps, to New Zealand herbaria, to the digitised flora and to plant nurseries. For this reason the Network is now the leading provider of plant information in New Zealand.

The second major achievement was the establishment of the New Zealand Threatened Plant seed bank achieved in conjunction with the Millennium Seed Bank in the UK. Project sponsor was MWH-NZ – a private engineering and environment company. The main partner was AgResearch, based in Palmerston North, where they already have experience in running the Margot Forde Germplasm centre mainly for agricultural seed. The result of that collaboration led to the seed bank being opened in August 2007 by the Minister for Conservation.

The Network's development of plant training courses for iwi in the form of a marae-based plant training programme is also a major achievement. These courses will be available on-line for use in every region of New Zealand. The Network's monthly newsletter – Trilepidea - is now read by over 2000 people and provides a great forum for people to communicate about plant conservation. The Network award scheme began in 2005 and has proved to be a great way to promote the work of individuals, schools, communities, plant nurseries and councils.

The Network has also collaborated with QEII (with funding from the Biodiversity Advice Fund) to survey private covenants for threatened plants and provide management advice to help landowners protect them more effectively. The Network has also been funded (again by TFBIS) to digitise all back issues of all New Zealand botanical society journals.

The Network has achieved many other things such as publishing New Zealand indigenous and naturalised plant lists. It has run a vote for your favourite plant competition for 4 years to promote the flora and find out why people like their native plants. Finally, the Network has raised more than $700,000 from sponsors and government grants.

Our failings

So what could be going wrong when it seems the Network is making a difference? For a start, forest remnants nationwide are being aerially sprayed with herbicide to clear them from the landscape. We think deforestation is something that occurs in the Amazon and Queensland, and in New Zealand a long time ago, but it is happening today and in most cases permitted under district plan rules. Dairying has also taken hold of many landscapes. This large scale intensification of agriculture across New Zealand has led to the most alarming of results. In 2008, the number of critically threatened vascular plants in New Zealand is set to increase by 65% (Peter de Lange pers. comm.) – that means 90 instead of 56 species on the brink of extinction, and there is still no legal protection in place for them. This ignores what may or may not be happening to our cryptogams and fungi.

The naturalisation rate of exotic species is another cause for concern. There are approximately 35,000 exotic species in New Zealand of which close to 3,000 have naturalised with perhaps a further 20 new naturalisations each year. There are now more naturalised exotic plants in New Zealand than indigenous species. When councils attempt to replace exotic species with natives, such as flax, there is a media backlash. Simon Upton writing in the Dominion Post suggested *flax is unmemorable so it can be annihilated without protest*. Rosemary McLoed in the same week applauded *gardeners who let exotics escape from their gardens.* Perhaps we need to frame our goals better so that all New Zealanders can support us in protecting and making wide use of our unique native species? In research done in 2006 by Ken Hughey and his team at Lincoln University they found that *about 80% of New Zealanders believe our natural environment to be good or very good.* The public perception is that nothing is wrong.

Then the floods came over the past four years from Whangarei to Dunedin, all a symptom of habitat destruction. There is an important connection between these and local and district authorities permitting the large scale removal of vegetation from upper catchments – a process continuing today because of permissive vegetation clearance rules in district plans.

Visitors to New Zealand may love native plants more than us and are willing to steal them. In 2005, two Czech botanists were arrested trying to leave the country with native orchids. Native plants are especially vulnerable where they do not occur on protected lands. Our knowledge of our natural world and indigenous plants is criminally poor, even government departments often do not have the skills to distinguish between native and exotic species.

Things are getting worse for our threatened flora, not better. The Network may not be doing a bad job but it is not stopping native plants from declining further. The Network, despite some important achievements, is failing in its attempts to adequately protect the threatened elements of the New Zealand indigenous flora.

The future

Despite the failings there are many options for the future. The Network must continue what it has been doing well (maintaining and improving the website, the newsletter and the seed bank). Key questions are whether the Network wants to see economically productive landscapes managed more sensitively for biodiversity? Or seeing local authorities taking greater care of their threatened flora? Do we want legal protection for our most acutely threatened species? Do we want private land owners proud of protecting threatened species and ecosystems on

their properties? Or as a minimum does it want an improvement in the status of New Zealand's threatened plants and threatened plant communities? And do we want a public that loves and nurtures their wild and cultivated native plant life?

New Zealand plant communities are being destroyed in the name of economic progress, there is nothing new there. However, there are a myriad of other *products* that our environment can provide us but which are being obliterated. They include, provision of clean water, soil conservation, carbon storage and aesthetically pleasing landscapes. The Network must offer tangible alternatives to wholesale destruction of nature, some options for change in an underperforming landscape. Models of good practice are needed and local authorities are an important player in all this. Some councils permit destruction of significant vegetation whilst others, such as Kapiti Coast District Council, have gone so far as to include threatened plants in their plan including policies and rules relating to sites where populations occur.

Bringing the New Zealand flora back from the brink might be done most effectively by encouraging New Zealand's 3,000 restoration groups to adopt or champion the cause of one threatened species. If we add threatened plants to restoration mixes then we may achieve great things. In terms of priorities it is important to prevent further losses from habitat destruction before we start thinking about restoration. Restoration is a social activity and important for that reason alone but in the near future we must protect what we still have left. Stopping clearance of indigenous plant communities must come before planting trees.

We must engage with everyone through *conservation in a cup of tea*, including landowners and many more with whom we must open up dialogue. The community, councils, business and schools should all be targets. For engaging business the best approach may be that planting trees and killing pests leads to carbon sequestration so the Network could assist move New Zealand towards a low greenhouse gas economy. The Network must also get smart about information delivery and messages about plants. It reaches half a million people annually via the website and is working to develop the first on-line illustrated flora-like database using fact sheets. Perhaps it should design local floristic guides for download.

More importantly perhaps, should we follow the lead of the Eden project in the UK? This botanic garden has four million visitors each year but their public message is simple. They promote plants, all plants, whether it is coffee, potato, hops or broccoli. The Eden Project doesn't suffer from species bias but wants to connect people to plants. Maybe that is where the Network should refocus – help New Zealanders love and value all plants - before embarking on the more challenging task of saving our native flora.

CITY SLICKERS: PROTECTING PLANTS IN NEW ZEALAND'S BIGGEST REGION

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For some nationally threatened plants human disturbance creating an analogue of a disturbance regime in the past is crucial to their survival. Often this goes unnoticed or is unconscious where, in pursuit of other goals humans unknowingly disturb in ways that provide habitat for threatened plants (Kirkpatrick 2007).

Sometimes these disturbances are viewed as a risk to the plant's survival when the opposite is the case. Removing or changing these disturbances threatens the persistence of these species. These disturbances need to be recognised, valued and explicitly maintained to protect these plants.

Many of these plants are early successional or low stature plants which prefer open sites, a habitat type which is no longer common due to habitat destruction and competition for these sites with naturalised plants. Some are able to persist in a modified, browsed or disturbed environment because it mimics this habitat type (open ground with low competition).

In Auckland, *Daucus glochidiatus* and *Pomaderris hamiltonii* grow on roadsides where the roadside management regime of reducing competition by using herbicide (for *Daucus*, an annual) and slashing (for *Pomaderris*) vegetation provides the seeds of these species bare open ground in order to germinate.

Trackside vegetation clearance in Waitakere enables *Myosotis petiolata* var. *pansa* to persist as clearance mimics its natural disturbance regime (by creating bare ground, redirecting water, eliminating tall stature plants, and providing a dispersal corridor) growing on material falling off coastal cliffs. The habitat for this population has been maintained by mowing and vegetation clearance. The vmanagement of this site is not to protected the rare plant thus it has been unconsciously conserved. The risks of loosing this population is high as the track is not fit for its purpose due to its steep grade and surface condition and it is being assessed for closure. Options to mitigate this involve continuing to maintain a track just for the rare plant.

Browse by exotic mammals can also reduce competition for disturbance dependant plants. Kawau Island is widely regarded as a botanical desert with no forest understorey and very low botanical diversity. Yet Kawau is the national stronghold for *Centipeda minima* subsp. *minima* which is found throughout the island in lawns, gardens, on and beside roads, wetlands, tracks, waste treatment pond, and other waste areas. For many of these plants the original habitat has gone e.g. loss of ephemeral wetlands, or is smothered in weeds. Habitat is created for *Centipeda* by wallaby browse which eliminates competition with surrounding vegetation (either native or exotic) providing competition-free space, unavailable in non-grazed areas, for *Centipeda* to prosper. The wallabies are targeted for eradication as they are regarded as a conservation pest. If the wallabies are keeping *Centipeda* on Kawau what is going to happen to it when wallabies are gone?

Survival of these species is being left to chance. Anthropogenic disturbance regimes may change at any time. The unconscious disturbance must become conscious not just to prevent accidental destruction of these populations but in order to communicate these human-disturbed habitats can be important for the conservation of disturbance dependant native and threatened plants. This is often not recognised by land-managers. The naturalness of a disturbance regime or place is not important. It is the process which enables threatened plants to survive.

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ECOSYSTEM SERVICES PROVIDED BY NATIVE NEW ZEALAND PLANTS IN VINEYARDS

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The use of native New Zealand plants to provide both ecological and economic value to viticulture and to agriculture in general is a relatively new endeavour. Few studies have assessed the specific contributions that native plant species may make toward ecosystem services such as conservation, weed suppression, soil stabilisation, carbon sequestration, biological control etc. within heavily modified agricultural settings. Such ecosystem services are vital to maintain and improve the productivity of agricultural systems and to reduce reliance on fossil-fuel-based inputs. Consequently native plants that can provide ecosystem services have the potential to be of significant economic and ecological value.

Figure 1: *Anaphalioides bellidioides* within the vineyard setting, potentially providing floral resources to vineyard natural enemies.

The enhancement of ecosystem services, such as biological control is one way native flowering plants may add value to agricultural production. By providing floral resources (nectar and pollen) the agricultural landscape can be made more favourable for resident natural enemies and less so to pests; this is called 'conservation biological control' (CBC). In contrast to past practices utilizing non-native plants, native floral resources provide potential, not only for enhanced pest control, but also for conservation, ecosystem restoration and eco-tourism.

Figure 2: *Leptinella* sp. proviing shelter to a vineyard natural enemy: the Seven-spot ladybird, *Coccinella septempunctata*

Placing native plant species within a vineyard setting offers the opportunity to assess their ecosystem value. Within viticulture the promotion of natural enemies, especially predators and parasitoids of lepidopteran pests is often the focus. Being intensively managed agriculture systems, vineyards are often highly disturbed environments unattractive to natural enemies of pests due to the lack of shelter, nectar, alternative prey and pollen. Utilizing conservation biological control for enhancing natural enemy fitness and consequently pest control will increase sustainability, due to the reduced need for pesticides and also reducing variable costs such as pesticides, fuel and labour. The external costs of agriculture including the costs of remedying negative effects on human health and the environment can also be reduced.

When testing the ability of a plant species to carry out CBC within an agricultural setting several factors require assessment, including agronomic practicalities and biological characteristics. Native plants are being assessed for their appropriateness within the vineyard setting, their floral morphologies, nectar qualities and effect upon the fitness of agricultural natural enemies.

Although in the past the goals of agriculture and conservation were seen as incompatible, it is suggested that land owners can use restoration as a means to sustain their productivity and in doing so simultaneously benefit the conservation of biodiversity[1]. Identifying native plants that are appropriate and significantly enhance the fitness

of important agricultural natural enemies would serve to promote restoration and protection of native plants in agricultural landscapes.

Notes:

[1]An example of this is the Greening Waipara project which is establishing native plants in the agricultural landscape of North Canterbury to provide ecosystem services to growers. For more information see http://bioprotection.org.nz/greening-waipara

IMPROVING UNDERSTANDING OF HISTORICALLY RARE ECOSYSTEMS

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Terrestrial ecosystems that were rare before humans colonised New Zealand often have highly specialised and diverse flora and fauna characterised by endemic and rare species. Although many such ecosystems are under threat from anthropogenic modification and their biodiversity values are declining, until recently they were not adequately identified by current land classifications. Williams et al. (2007) compiled a list of 72 rare ecosystems from the literature and by canvassing New Zealand ecologists and land managers. Rare ecosystems were defined as those having a total extent less than 0.5% (i.e., < 134 000 ha) of New Zealand's total area (268 680 km^2). 'Rare' encompassed ecosystems that are small in size (e.g. 100 m^2 to a few hundreds of hectares) but geographically widespread (e.g. coastal dune deflation hollows), to those that are larger (e.g. ten thousands of hectares) but geographically restricted (e.g. frost flats on the volcanic plateau) (cf. Rabinowitz 1981). Many of these ecosystems occur in extreme environments and as a consequence lack trees, despite being lower in elevation than the regional treeline. Examples of historically rare ecosystems include basic cliffs, scarps and tors, volcanic dunes, strongly leached terraces and plains (i.e. 'Wilderness' vegetation) and granite sand plains (Fig 1a-d). Such systems often support nationally threatened endemic species (e.g., *Myosotis australis* var. *lytteltonensis* on basic cliffs, scarps and tors of Banks Peninsula), species with limited distributions (e.g., *Muehlenbeckia ephedroides* which is restricted to braided riverbeds, shingle beaches and inland outwash gravels) and may support specialised life forms (e.g. halophytes in salt pans, tropical taxa in geothermal areas). Furthermore, such ecosystems often provide important refuges for native plants and animals within highly modified landscapes (e.g., Wiser & Buxton, 2008).

In 2007 the Ministers of Conservation and the Environment issued a joint statement of national priorities for protecting rare and threatened native biodiversity on private land (http://www.biodiversity.govt.nz/pdfs/protecting-our-places-brochure.pdf). This statement provides local authorities, communities and private land owners with information about the types of ecosystems and habitats on private land that, from a national perspective, are most threatened and hence in need of protection. These national priorities are to protect 1) indigenous vegetation associated with land environments (defined by Land Environments of New Zealand at Level IV) that have 20 percent or less remaining in indigenous cover; 2) indigenous vegetation associated with sand dunes and wetlands (ecosystem types that have become uncommon due to human activity) 3) indigenous vegetation associated with 'originally rare' terrestrial ecosystem types (based on Williams *et al*. 2007); and 4) habitats of acutely and chronically threatened indigenous species.

The policy initiative in combination with the Williams et al. (2007) classification has catapulted historically rare ecosystems up the biodiversity protection scale as demonstrated by increasing recognition in setting protection priorities, in Government policy, and during the resource consent process. For example historically rare ecosystems now influence national protection priorities of the Biodiversity Condition and Advice Funds, QEII Trust, the Nga Whenua Rahui Fund and the Nature Heritage Fund. Regional councils and territorial authorities are using the statement to guide their priority setting regarding on-the-ground actions and biodiversity responsibilities under the RMA (e.g., Taranaki Regional Council, 2008; Marlborough District Council, 2008; Environment Canterbury, 2007). Local funders of biodiversity protection and management are also taking the strategy into account (e.g. Dunedin Natural Heritage Fund, Whangarei District Council Environmental Enhancement Fund) and LINZ has included the National Priorities as one of the biodiversity protection options whereby a lessee of Crown Lands can qualify for a rent reduction. Importantly, the resource consent process is now including rare ecosystems as significant indigenous vegetation (Golder Associates 2008), and agribusinesses are including these ecosystems in industry guidelines for sustainable development (e.g., Hill Young Cooper Limited 2007).

Because of these efforts, policy makers, conservation practioners and landowners need to be able to recognize

different types of historically rare ecosystems and to know where they occur. To this end, a website providing fact sheets on each of the 72 ecosystems defined in Williams et al. (2007) was launched in April 2008 (New Zealand's historically rare ecosystems' http://www.landcareresearch.co.nz/research/ecosystems/rare/). These fact sheets provide information about each historically rare ecosystem including definitions, photographs, descriptions of current threats, lists of notable flora and fauna, and major references (Fig 2). Further, the Department of Conservation is developing GIS maps of the current extent of each ecosystem type. In addition to guiding land use planning, these maps will allow the degree to which adequate examples of each system are currently protected to be ascertained.

Landcare Research runs a research progamme focused on historically rare ecosystems (funded by the Foundation for Research, Science and Technology; (http://www.landcareresearch.co.nz/research/obi.asp?Proj_Collab_ID=3). Our research is expanding on current knowledge to provide a stronger foundation for ensuring that examples of all types of historically rare ecosystems are legally secure for conservation under either crown or private tenure, and to ensure that management actions are appropriate to guarantee the retention of these unique environments and the biota they contain. We are doing this by 1) identifying historically rare ecosystems nationally; 2) typifying the biota and controlling processes; and 3) determining major threats.

We used a systematic approach to determine which historically rare ecosystems were the highest priority for study (Wiser *et al.* 2008). For each of the 72 ecosystems (Williams et al. 2007), we summarised the:

- Degree of knowledge – where they occur and what biota they contain
- Types and degree of threats to their integrity
- Geographic extent (i.e. total area and geographic range)
- Biotic importance (i.e. presence of endemics and threatened species)
- Community interest
- Current research being undertaken
- Landscape context (occurrence in natural versus anthropogenic landscapes)

We selected one ecosystem for study that is widespread across New Zealand, perceived as highly threatened, but poorly understood. Ecosystems that fit these criteria are dune deflation hollows, shingle beaches, stable sand dunes, frost hollows and seabird guano deposits. We selected shingle beaches for study. Secondly, we focused on those systems that are restricted to a given region

Figure 1: Basic outcrop on Mt. Herbert, Banks Peninsula, Canterbury, with vegetation comprising stunted shrubs, grasses and herbs

Figure 2: Volcanic dunes of the Rangipo 'Desert', with widely space bristle tussock, *Rytidosperma setifolium* and islands of shrubby vegetation

Figure 3: Bog pine (*Halocarpus bidwillii*) heathland on strongly leached plain at The Wilderness Scientific Reserve, Southland (Sarah Richardson)

Figure 4: Granite sand plain on the Lookout Range, NW Nelson.

and poorly understood. Fourteen ecosystems met these criteria and we chose Northland gumlands, granite sand plains (NW Nelson) and granite gravel fields (Southland) for study.

To typify the biota of each system and determine its ecological importance we conduct sampling to determine 1) the proportion of the regional and national biota (plants and select groups of invertebrates) it contains; 2) how distinct it is from the matrix vegetation that surrounds it; 3) how distinctive individual sites are from each other; and 4) characteristics of sites supporting populations of important rare or threatening exotic species. In 2008, we completed sampling of shingle beaches (61 sites across New Zealand), Northland gumlands (17 sites), and NW Nelson granite sand plains on the Lookout Range.

From analysis of the shingle beech data, we have gained an understanding of controls on their regional and national biodiversity. At a national scale, environmental measures derived from geographical location (i.e. climate variables) explain differences among beaches. The proportion of exotic plant species increases on drier, warmer beaches, whereas rare native species are broadly distributed geographically. Within-site composition is related to stoniness. Exotic species are more common on quadrats with more gravel, whereas rare species typically are not distributed with regard to particle size.

Important serendipitous discoveries from shingle beaches, gumlands, granite sandplains include 1) new native species (e.g. *Hydrocotyle* at the mouth of the Wilson River in Southern Fiordland; species of Lepidoptera - *Clepsicosma*, *Megacraspedus* and *Kiwaia* in gumlands); 2) threatened species (e.g. threatened sedge *Baumea complanata* in a Northland gumland; 3) distribution extensions (e.g. rare shrub *Muehlenbeckia ephedroides* extended its northern limits within the Marlborough Sounds by 50 km); and 4) several potential biosecurity threats (e.g. the exotic grass *Avena barbata* first record in the South Island on the Nelson Boulder Bank; exotic ant *Hypoponera confinis* at Turakirae Head, Wellington).

As well as providing some basic understanding of the ecology and biodiversity of these systems, our results have the practical application of providing the information required to set conservation priorities.

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FACTSHEET – SHINGLE BEACHES

Shingle beach at Cobden Beach, West Coast (Susan Wiser)

Shingle beaches are comprised primarily of a mixture of sand, water;smoothed gravel (>50%, particles 2-64 mm), and cobbles. Low vegetation occurs inland from the foreshore on the berm and backdune. Shingle beaches occur where rivers deliver large quantities of shingle to the coast or where it is being eroded from nearby coastal cliffs. Shingle beaches usually rise to a ridge that is rarely disturbed by the sea, and a lagoon may be impounded behind.

Where do they occur?

Vegetated shingle beaches occur in many coastal areas, and are particularly abundant on the North Island and South Island east and south coasts.

Threats

Shingle beaches are prone to invasion by numerous exotic herbs, grasses, and shrubs, especially when adjacent to urban or agricultural areas. When adjacent to agriculture, landward areas are particularly vulnerable to fertilising and grazing. Many have been planted with exotic trees. Rabbits and hares may be locally abundant. Where accessible, roads and tracks are often built along them and 4WD vehicles can be especially damaging to the low, scattered vegetation.

Notable Flora and Fauna

Rare plants include *Myosotis pygmaea var. minutiflora*, coastal eryngo (*Eryngium vesiculosum)*, pingao (*Desmoschoenus spiralis)*, small vegetable sheep (*Raoulia beauverdii)* , leafless pohuehue (*Muehlenbeckia ephedroides*), trailing fuchsia (*Fuchsia procumbens*), New Zealand spinach (*Tetragonia tetragonioides*), *Senecio carnosulus*, thick-leaved mahoe (*Melicytus crassifolius*), prostrate broom (*Carmichaelia appressa*), *Leptinella minor*, Australian orache (*Atriplex australasica*), grey saltbush (*Atriplex cinerea*), bushy peppercress (*Lepidium desvauxii*) and the shingle beach endemic *Raoulia* aff. *hookeri*. Rare invertebrates include an egg-laying velvet worm (*Ooperipaltellus viridimaculatus*), an ant-like flower beetle (*Floydwernerius gushi*), and the Cloudy Bay mat daisy jumper moth (*Kiwaia* sp. cf. *jeanae*),. The exotic ant, *Hypoponera confinis* , new to NZ, is known only from one shingle beach locality.

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Links

Landcare Research: research on shingle beach biodiversity

Shingle beaches in the United Kingdom: biodiversity action plans

SUMMARY OF CONFERENCE WORKSHOPS

Workshops were held on Saturday 9 August to review the Network programme over the last 5 years and look at what could be done over the coming 5 years to implement further the goals of the Global Strategy for Plant Conservation and the vision of the network?

The five Network workshops were loosely based around the Global Strategy targets:

- In-situ protection of plant life
- Ex-situ management of plants
- Plant promotion, advocacy and information
- Training and education
- Research

IN-SITU PROTECTION OF PLANT LIFE

Facilitator: Bec Stanley (Auckland Regional Council)

Possible aims:

1. To determine methods the Network can use to achieve greater physical and legal protection for threatened plants and their ecosystems.
2. To determine the most important agencies, businesses and relationships the Network must build to achieve this protection
3. To identify actions that will help slow down the insidious decline that is occurring in plant communities and threatened plant populations
4. To identify priorities for habitat protection and how these can be achieved

Priority recommendations:

- Communicating which plants are threatened and where they grow is crucial for protection to prevent destruction. The Network must increase advocacy to territorial local authorities about the threatened plants that occur in their patch. This involves improving district plan rules and educating council staff and councillors about the needs of New Zealand' threatened flora. The local authority threatened plant lists on the website should be improved and promoted urgently to councils.
- Network to develop a national register of threatened plant sites and develop a national signage system that all agencies can use to identify these sites (where appropriate) so that contractors do not destroy them.
- Further develop the Network website with information about rare and threatened ecosystems and information about succession and disturbance.

Notes from discussions

- The importance of knowing which plants are threatened to prevent accidental destruction of plants and their habitats:
  - train contractors (e.g., road side maintenance engineers). Train local advocates for plants (they must be familiar with the law). Develop materials to advise how to restore threatened plants and to help landowners with identification
  - Understand land owner constraints
  - Network members could run public workshops about local plants
  - Encourage land managers to join the Network
  - Direct developments to sites without threatened flora. Hold Network meetings with recreation groups e.g. mountain bike clubs, or establish an award for sensitive/ environmental awareness of recreation
  - Talk one on one with those that manage threatened plant populations
  - Promote surveys and uploading information as plant lists to the network website
  - Develop a national NZPCN sign for use by community or councils or Department of Conservation to alert contractors to the fact that a special floristic feature occurs at a particular place (e.g. symbol or design) – use this sign at all sites on national register and communicate use of this sign to all agencies and undertake advocacy to get this system working (attract sponsors for this idea). Sign should include "Ring this number: 0800 XXX.
- Lack of legal protection for plants on unprotected land is a threat to plants.
  - Network to lobby for legal protection of ecosystems
  - Develop materials that explain the legal issues when protecting plants
  - Increase advocacy to TLAs to improve district plan rules and educate they about the needs of New Zealand' threatened flora – promote to TLAs the threatened plant lists on the website.
  - Ensure councils have access to accurate information about threatened plant occurrences so that they can be identified in Assessments of Ecological Effects
  - Educate policy makers and ensure MfE is aware of threatened plant issues in next Statement of the Environment
  - Develop a national protected areas database with integrated information about reserves, and threatened plant site and weeds.
  - Main role for Network is information provision especially into district plans and national policy and legislation. This means focussing advocacy at higher levels than members can do on their own.
- Advice to people who manage sites where threatened plants grow:
  - Develop and promote a minimum care code for plant life to direct management ("if you have a peat bog…")
  - Create a register of threatened plant sites (similar to the historic sites register)
  - Develop grant scheme for private landowners to carry out pest control
  - Develop information for the website about risks and benefits of pest control so that pest control does not harm threatened plant sites. A land manager may not realise the potential negative impacts of removing grazing for example when a riparian area is fenced off (which seems like it would be all positive).Identify plant species that are most vulnerable to particular pests
  - Add eradication / control information to website for pests or link to other resources

- Collection/harvesting could endanger small populations, e.g. collecting specimens by rare plant enthusiasts and plant nurseries, moss removal, seed collection for horticulture. Ways to mitigate this include:
  - Establish a regional seed exchange / seed distribution for threatened plants (a web blog or forum may help)
  - Develop and implement eco-sourcing and accreditation system
  - Identify accredited seed collectors
  - Promote the use of the seed bank
  - Develop resources that show how to build up a depleted population without harming it.
- Habitat Destruction is a major threat to plants and their habitats:
  - Slow down habitat destruction through promoting the Community Conservation Fund (which can be used to protect threatened habitats) or NZPCN could undertake threatened plant restoration on public conservation land by applying to this fund.
  - Develop factsheets on website about IPAs or ecosystems (rare ecosystems, threatened ecosystems or special plants)
  - Provide news headlines and allow members to react – "Did you know this threatened plant or ecosystem is being mined?"…"Did you know X% of plants are threatened.
  - More work and less talk – network to identify key sites and species that need attention
  - National action on education – Network must advocate for it – especially indigenous plants and legislation.
  - Network could help coordinate weeding groups to protect threatened plant sites
  - Research on the possible impacts of climate change on habitats of our threatened and common flora
- Collate case studies about succession (as a lesser-known threat to plants) and publish in newsletter
  - Develop factsheets about succession and the flow on effects
  - Provide information on the value of wastelands and roadsides
  - Describe disturbance on the Network website and provide information on innovative use in saving threatened plants e.g. roadside maintenance providing conditions for early succession plants
  - Communicate value of early succession habitats as opposed to mature forests where most people perceive there are more values.
- Involving Network members in *In-situ* plant protection:
  - Develop resources about how to find an expert near you – use website to direct people/developers/ consultant ecologists to their local experts
  - Develop Network resource or forum for on-line experts to help amateurs and community (by answering emails)
  - Identify other groups that we as members can help e.g. QEII, community groups doing restoration.
  - Disease monitoring could be done by members (funding is needed to develop training)

EX-SITU MANAGEMENT OF PLANTS

Facilitator: David Sole (Manager Wellington Botanic Gardens, Wellington City Council)

Possible aims:

1. To determine how to increase use of the national threatened plant seed bank
2. To examine how stronger partnerships may be built between the Network and botanic gardens and the nursery industry
3. To determine how threatened species may be managed more effectively in ex-situ collections
4. To ensure use of weedy introduced species is minimised in New Zealand gardens and horticulture
5. To increase usage of threatened species in restoration programmes

Priority recommendations:

- Develop information about threatened plant and their lead times for restoration and site information
- Roll out marae training course on propagation of plants and how to run a nursery
- Set milestones for seed collection for seed bank (i.e., 30% by 2012) and for motivation and prepare flyer describing the collection and depositing process
- Network develop accreditation system for ecosourcing
- Network to approach Editors of gardening magazines to promote native plants

How to increase use of the national threatened plant seed bank?

- Network should work with QEII to identify covenants that could provide seed to seed bank
- Network to promote the seed bank with information and flyers covering the depositing process.
- Ensure database is accessible to collectors so they can see what has been collected and from where
- Request local government to fund land owners to collect seed
- Provide training in seed collection and ensure collectors verify provenance
- Research on managing seed viability
- Seek funding for regional collectors to travel around collecting
- Ensure collector verification process is robust
- Ensure information is provided about what use the seed will be put to
- Ensure the network coordinates the capture of genetic and geographic variation for all threatened species
- Set milestones for collection (i.e., 30% by 2012) and for motivation
- Long term potential to expand to Oceania

To examine how stronger partnerships may be built between the Network and botanic gardens and the nursery industry

- Some nurseries already have close links so build on this
- Work with International Plant Propagators Society and other partners
- Attend conferences
- New Zealand Plant Conservation Network accreditation for eco-sourcing
- Develop promotional partnerships to drive demand
- Foster specialist propagation
- Cultivation is missing from the Network Vision statement
- Run training module to support community nurseries
- Develop concepts of botanic gardens without walls and beyond the gates
- Develop registry of ex-situ plants / collections (including private collections)
- Provide web links to all nurseries and gardens
- Work closely with Botanic Gardens of Australia and New Zealand (BGANZ)
- Network should promote stronger links between individual nurseries, gardens and the Department of Conservation and councils
- Foster positive relations (encourage articles for newsletter)
- Identify and develop project partnerships between gardens and nurseries.

To determine how threatened species may be managed more effectively in ex-situ collections

- Identify and help allocation of propagation projects so that nurseries that have expertise in particular species can continue with those species
- All plantings must be recorded and mapped
- Must ensure genetic variability is protected ex-situ
- Share information – who has them, who is replanting, what provenances
- Allocate species to certain agencies to protect ex-situ
- Establish regional networks for threatened species management
- Acknowledge WAI 262
- Ensure engagement occurs with community nurseries
- Link work to plant species recovery plans
- Quantify partnership between Department of Conservation and botanic gardens in recovery plans
- Provide an on-line forum for ex-situ managers of plants and a clearing house mechanism
- Improve national network for botanic gardens

- Improve systematic protocols for collection and accession to garden collections
- Identify weak points (currently BGCI focuses on drylands)
- Not always just about threatened species (data deficient species may be a priority as well as cryptic species)
- Look at options for increasing capacity within gardens for ex-situ work
- Use botanic gardens as story tellers for the plant conservation story
- Identify botanic gardens overseas that have New Zealand species
- Develop protocols for seed exchanges and release of material
- Provide volunteer experiences for managing threatened species in ex-situ (e.g., private gardens)

To ensure use of weedy introduced species is minimised in New Zealand gardens and horticulture

- Determine how public recognise weeds
- It is not just woody weeds.
- Open up effective consultation with nursery industry
- Create body of understanding about weeds
- Ensure stock of weed species is sterile or male plants only
- Take opportunities to create / exploit web resources as required
- Ensure territorial local authorities are aware of Pest Plant Accord and get concepts into District Plans
- Promote pan –organisational agreements
- Identify key weed threats to threatened species at sites
- Advocate and promote Pest Plant Accord
- Establish nursery accreditation for No Pest Plants
- Advocate for native plants while talking about weeds (Plant me Instead concept)
- Change perceptions to avoid 'best sellers'
- Update legislation regularly
- Highlight 'work arounds' – i.e., situations where importation of plant germplasm is occurring under deliberately incorrect names to get around Biosecurity regulations
- Botanic gardens have to take responsibility
- Use the Department of Conservation's "Plant me Instead" book as a model for communicating to public
- Network to encourage gardeners to take responsibility for garden weeds
- Education of children is important
- Work with councils to provide free green waste dumping
- Find palatable ways to understand and articulate the scope of the weed problem

- In the Urban environment ensure that people know how it affects them
- Network to approach Editors of gardening magazines to promote native plants

To increase usage of threatened species in restoration programmes

- Develop information about threatened plants and their lead times for restoration and site information
- Develop growing skills by running marae training courses
- Advocate to environmental consultants about threatened plants and their use
- Change motivation from developers being demanded to use threatened plants to them desiring them
- Work with territorial local authorities to ensure they set rules through resource consent process
- Re-vegetation plan must include provision for succession and recruitment
- Network should develop prescriptive instructions for sub-divisions at resource consent level
- Build nursery capacity
- Accept that there is a loss of production resources from private sector
- Genetic research to support guidelines
- Create awareness of auditing – verifying provenance of re-vegetation species.
- Communicate threatened plant options nationwide to community restoration programmes

PLANT PROMOTION, ADVOCACY AND INFORMATION

Facilitator: John Sawyer (Biodiversity Supervisor, Department of Conservation)

Possible aims:

1. To determine how the Network website might be developed in the future
2. To recommend types of publicity materials required by the Network to achieve greater promotion of and publicity for plants
3. To determine how to improve the newsletter and increase contributions
4. To identify priorities for development of advocacy tools and information

Priority recommendations

- Promote the webpage, maximise connections and complete and improve content
- Develop promotional materials for the Network (display or banners) that can be used nationwide at events and conferences
- Assist Network patrons with promoting native plants through their work
- Seek plant conservation legislation for acutely threatened plants
- Develop a series of posters about plants for everyone to use (schools, libraries etc) – use Enviroschools to help analyse needs
- Establish a web forum and conservation alerts about issues
- Promote the Network to magazine editors and provide stories and articles to them about plants
- Establish a newsletter column plant conservation columnists (pro and against)

Publicity materials

- Endorse and promote publications by other groups/people
- Establish an Eco-sourcing accreditation scheme with labels showing provenance and Network logo (include accredited nurseries on the website and include Network displays at nurseries) "Plants are great, Natives are better, Eco-sourced are best!"
  - Develop posters for lay people and schools promoting:
  - Threatened plant families
  - Broccoli and threatened cresses
  - Crazy daisies – New Zealand tree daisies
  - Beautiful buttercups
  - Boomer brooms
  - Limestone plants (basicoles)
  - Extinction is forever
  - Local common / threatened plants posters
  - School posters targeting needs

- Make leaf shape fridge magnets ('collect the set')
- Provide garden centre labels "rare in the wild including Network logo and web address.
- Develop promotional materials for the Network (several kit set displays or banners) that can be used nationwide at events and conferences. This may include Powerpoint presentations and vinyl posters and brochures.
- Run competition for fine arts / graphic design industry for photography, paintings, sketches with themes such as urban spaces, flora in the landscape etc.
- Make use of the website images in calendars, t-shirts, postage stamps and stickers with web address
- Approach popular companies to reach all demographics e.g., Glassons, Hallensteins, Chalky digits. Ask for help from marketing / PR companies
- Promote New Zealand flora icons (and regional icons) to the public and tourists and regional tourism organisations.
- Invite/invoke peoples curiosity about plants and about the Network
- Include 'bad' news in newsletter and publicise widely
- Develop and provide materials for:
  - Farmers and invite speakers to next conference
  - QEII reps
  - Fonterra
- Provide threatened or significant habitat information to TLAs
- Include brochures on the website as pdfs
- Develop local flora guides to tourism hotspots e.g., Abel Tasman, Mt Cook etc.
- Promote the iconic worth of New Zealand natives

Network promotion – who is not getting the message?

- Work to raise awareness of the Network and its website resources amongst landowners and all agencies working with landowners:
  - Federated Farmers
  - QEII Trust
  - Landcare Trust
  - Iwi
- Provide information about Network and website to 'key contacts' at universities so that students are aware of how to join and what is available on the website. Promote the plant research needs to universities (via the website and an annual prospectus))
- Promote the Network to recreation groups and walking magazines such as New Zealand Tramper offering fact sheet connections to publications and websites
- Be proactive and offer articles to magazines such as F&B/Wilderness, the Landcare network, North and South, regional papers, gardening magazines and council newsletters.

- Ensure all NGO and community groups have information about the Network website.
- Promote the Network to local and district authorities to demonstrate the information available about their local plant life
- Promote the Network to politicians through questions to election candidates and through letters to members of parliament
- Promote the Network to other conservation groups such as Forest & Bird, botanical societies, the ecological society, Landcare Trust, WWF and Greenpeace. Share goals and website links
- Promote the Network to schools and LEOTC and at science festivals
- Hold and attend public events with displays e.g., Ecofest, A&P shows, flower shows
- Establish a presence at public places through posters and brochures at libraries
- Develop local restoration projects where members can be actively involved in protection of an important plant area
- Put out regular media releases and invite media to attend events
- Overlap conference with fauna experts to break down barriers and educate about flora issues or at least seek more networking with other organisations
- Promote the network to Secondary schools and ensure information is included in the curriculum
- Continue to work with Enviroschools
- Work with QEII and its board, with NZCA, conservation boards, Nga Whenua Rahui and FMC.
- Work with scouts and guides
- Promote the website to students and universities

Newsletter ideas

- Seek sponsorship for the newsletter
- Identify ways to expand further the newsletter audience beyond New Zealand Plant Conservation Network members.
- Consider engaging a (maybe paid) columnist to write a regular column (light hearted or anecdotal)
- Review format and audience
- Include cartoons
- Increase the archive value by including content that is valuable as a long term resource.
- Include a member profile (what are they doing and where?).
- Have newsletter issues devoted to a particular region and request articles from local groups.
- Source material from other newsletters and publications
- Encourage "*Member's news*" by including a section for short contributions from members.
- Include a weed of the month and describe why it is threatening native plants.

- Include a submissions due column
- Provide book reviews and information about publications that are available.
- Include conference papers.
- Ask for Council members to write editorials
- Highlight local events such as a TLA replacing exotic trees with natives in a street planting or planting threatened species in highway median strips
- Improve newsletter with thorough proof reading
- Include articles about school plant programmes such as Enviroschools
- Add a mystery plant feature and invite people to identify
- Add a "*Did you know*" fact box on New Zealand flora
- Include news from other organisations such as QEII, Department of Conservation, Botanical Societies
- Use name and shame tactics for environmental degradation
- Provide incentives to submit articles to the newsletter
- Encourage contributions from botanical celebrities and stories about plant people icons
- Develop rules for submitting to the newsletter to save the Editor time in formatting
- Include a "How to" section – Plant pressing, getting a collection permit, seed collecting etc)
- Experiment with formatting
- Make sure the newsletter has a separate niche from other botanical newsletters.

Website ideas

- The website is a wonderful and nationally important resource.
- Improve the text so that it is easier to read, changing fonts, font sizes
- Provide text that is user friendly for novices as well as the high level scientific descriptions
- Provide hooks for children such as interesting facts about each species or add a plant quiz
- Complete the fact sheets
- Include information about threat mitigation, how do you stop species or communities declining.
- Include conference presentations on the website
- Provide links to other websites such as NZBRN, other herbaria, pest damage websites (e.g., insects) and botanical society websites
- Provide distribution information about each species for ecological district or territorial local authority with maps
- Include illustrations from existing publications if permission can be obtained.
- Increase the size of the plant list database and set up system to allow botanists to add their lists

- Add a GIS system for viewing plant distributions on maps
- Show latest changes in nomenclature/taxonomy with links to literature
- Provide stable URLs for plant names
- Provide a members forum (with moderators checking content)
- Provide a Conservation alert system with links so that members can be made aware of issues and how they may personally respond
- Provide a tool for creating regional publications about plants.
- Add a system to check spelling ..."did you mean...?"
- Provide an on-line polling system for issues "Do you think national legislation is needed for plants?"
- Provide plant list search engines with maps
- Add querky information to plant fact sheets about cultural and historical aspects.
- Promote the website address to target groups such as landowners
- Add plant community information such as dunes, wetlands and forests and rare and threatened ecosystems
- Digitise out of print material
- Determine the relationship between the network's on-line flora and the work of Landcare.
- Provide fauna information about what plants are host to what species
- Provide e-commerce facilities to allow people to pay on-line for membership and products
- Improve etymology for all Latin and Maori names
- Provide a photo of the day/moth on the home page and cycle through the database of images.
- Ask local libraries to link to New Zealand Plant Conservation Network from their reference pages.

TRAINING AND EDUCATION

Facilitator: Philippa Crisp (Landcare Advisor, Greater Wellington Regional Council)

Possible aims:

1. To identify priorities for training and education in plant conservation
2. To determine how best to deliver plant training courses nationwide
3. To determine how to build relationships with schools and Enviroschools
4. To identify gaps in plant conservation training and education
5. To ensure national curricula include education about native plants
6. To develop ways of monitoring our success with education about native plants

Priority recommendations:

- Develop standard New Zealand Plant Conservation Network presentations that can be downloaded from the Network website by members
- Make use of iwi Trust boards to secure funding for delivering training courses
- Complete all 5 marae-based plant training modules and increase delivery of them nationwide
- Advocate for information to be includes in new curricula (for both primary and secondary schools)
- Monitor the impact of this work by undertaking surveys and counting the number of presentations given and how many times courses are run and how many regional policy statements and district plan include information about threatened flora

Discussion of issues:

- The priority audiences were identified as iwi, ethnic groups, children and adults but that different strategies would be needed for each group.
- An important role is to educate the educators
- The Network should work to influence the curricula and teacher training programmes
- Publish stories and articles in the school journal
- Training should be directed at Territorial Local Authorities and restoration groups especially with regard to information about local threatened plants. The website TLA plant lists should be reviewed and corrected
- Develop Powerpoint presentations covering a variety of topics. Make these available to NZ Plant Conservation Network members to use in various fora
- Training sessions for Network members would be valuable especially in how to deliver the Plant training modules. These could be delivered at the conference instead of a field trip
- Promote use of New Zealand Plant Conservation Network information in the Department of Conservation's Conservation Management Strategies using a template for each region and in the regional councils Regional Policy Statements

- Important to raise awareness of weed species and their identification
- An education area should be established on the Network website with links to documents, training booklets and modules and other sources of information
- Continue to work to build iwi relations through use of the plant training modules and other events

RESEARCH WORKSHOP

Facilitator: Mike Thorsen (and Peter de Lange)

Aims:

1. To determine how best to promote existing threatened plant research
2. To determine what actions the Network can take to increase research on threatened plant species and communities
3. To identify research priorities that can be promoted by the Network
4. To provide ideas on how to fundraise for the David Given Scholarship

Priority recommendations:

- Documentation of the problem and some solutions. Maybe as a summary of the state of plant research in NZ?
- This can then be used for lobbying purposes to with research funders and other involved organisations
- Increase funding in deficient areas (hopefully from the lobbying)
- Assistance in training/developing new researchers (and this also applies to field botanists). Discussion was held on the lack of this and a mentoring scheme was discussed. Opportunity for involvement of budding researchers in existing research programmes.
- The need for much better communication of research results. Need to be disseminated to the appropriate people in the appropriate language. A suggestion is to have on the website a summary of recently completed research

Other actions:

- Develop a Research section on the website
- On the website have a directory of researchers, their research interests, and current research projects, with links to relevant websites
- On the website maintain a database of research needs/ideas – currently some institutions have lists of these. Should be linked to a contact person who can provide more detail, include if funding available. This would be very useful to students looking for thesis ideas
- Development of a NZPCN research strategy (links to point 1)
- Better liaison with other conservation organisations including NZ Botanical Society
- Facilitate better networking of researchers (in NZ and internationally)
- Access NZ-relevant literature – currently impossible unless member of an institution with specific search engines. Maybe a database of research papers with abstract and keywords. Should include "grey" literature
- Push for small funds project – witness the success of $5K/year for Olearia. Imagine what could be achieved if threatened plant groups had a similar level of funding.

Issues raised

- Lack of funding
- Lack of biosystematists
- Shortage of researchers
- Lack of practical training
- Lack of experienced field botanists
- Possibility of using professional communicator
- Loss of knowledge as people depart this vale of tears
- Factionalism in such a small field
- Review of overseas plant legislation to pick out the good points that could be used in NZ legislation.
- Need for long-term studies and longitudinal studies
- Data sets in notebooks and data set archiving
- Time required to publish from thesis
- Sponsorship opportunities

Key Research themes

- Breeding systems of plants
- Population dynamics of plants
- Ecology and autecology
- Disturbance ecology
- Mechanism of threats to ecosystems and plants
- Habitat change
- Taxonomy

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ISBN 978-0-473-14950-5