Risk assessment for the New Zealand National Pest Plant Accord: which species should be banned from sale?

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Summary
The National Pest Plant Accord (NPPA) is an approach used in New Zealand to manage the problem of invasive plants that are in the horticultural trade. It is a cooperative agreement between central government agencies, local government agencies and the Nursery and Garden Industry Association. Species included in the Accord list are legally prohibited from sale, propagation and distribution under provision of the Biosecurity Act 1993. There are hundreds of invasive or potentially invasive plants in New Zealand, but it is neither desirable nor feasible to include every invasive plant on the Accord list.

A robust and transparent weed risk assessment process is required to support decision-making and prioritization for which taxa to include on the Accord list. Criteria for inclusion in the Accord list were developed and assessments were conducted by members of a Technical Advisory Group (TAG). Approximately 200 taxa were assessed and prioritized by the TAG in 2005. No current weed risk assessment tool was available to determine taxa for the NPPA list, although some existing systems were used to provide additional information. The criteria and process used are described, and future directions and improvements are discussed.

Keywords: Invasive plants, horticulture, weed risk assessment.

Introduction
The use of invasive plants in horticulture is a well-recognized and often contentious issue (see for example Reichard and White 2001). New Zealand has taken a number of approaches to limiting the spread of invasive plants through horticulture. The first was in 1983 when the sale of six aquarium species was banned under the Noxious Plants Act (1978) (Champion 2005). In 1993 a voluntary agreement called the Forest Friendly Award scheme included 23–28 terrestrial species (Craw 1994). The next approach used was the National Surveillance Pest Plant List in 1996, which contained approximately 110 species that were banned from sale (MAF 2000). This list was managed through local government and there was some regional variation in the species included.

Since 2001, the New Zealand approach to the management of invasive plants in horticulture has been a cooperative agreement between central government, local government and industry. The agreement is known as the National Pest Plant Accord (NPPA). The main focus of the NPPA is education and awareness, but plants included on the NPPA list are also prohibited from sale, propagation and distribution throughout New Zealand under the Biosecurity Act (1993).

The purpose of NPPA is to prevent sale, propagation and distribution of invasive plants in the horticultural trade, including the less formal part of the trade such as markets and fairs. Inclusion of a taxon on the NPPA list does not impose obligations on landholders or agencies to manage that taxon; this type of management is addressed through Regional Pest Management Strategies administered by Regional Councils or other local government agencies who have responsibility for pest management.

The NPPA process
The selection of taxa for the 2006 review of the NPPA list was managed through three key groups, the Consultative List, the Technical Advisory Group and the Steering Group.

The **Consultative List** includes staff of central and local government agencies, members of the horticultural industry and the wider public. Member of this group can nominate potential NPPA plants and comment on the assessments that have been done on those taxa before a final decision is made.

The **Technical Advisory Group (TAG)** is made up of scientists with a range of expertise relevant to assessing taxa for inclusion on the NPPA list. This group recommends which of the taxa nominated by the Consultative List should be considered by the Steering Group for inclusion on the NPPA list.

The **Steering Group** is made up of representatives from MAF Biosecurity New Zealand, the Department of Conservation, Regional Councils and the Nursery and Garden Industry Association. This group determines the final list of NPPA plants based on recommendations of the TAG and factors related to costs of implementing the NPPA (for example the value of that plant to the horticultural trade or other groups).

The TAG assessment process
Criteria for the TAG
There are hundreds of invasive or potentially invasive plants in New Zealand, but it is neither desirable nor feasible to include every one on the Accord list. The original NPPA list contained 92 taxa, and an additional 108 taxa were nominated by members of the Consultative List. Typically, species are nominated and assessed, but in some cases subspecies, varieties or cultivars may be assessed separately. Some of the nominations were for whole genera, but in these cases individual species within the genus were assessed. The TAG therefore had 200 taxa to assess and prioritize, within a limited timeframe and budget.

The assessment criteria for the TAG are outlined in Champion (2005). There are three main factors that determine whether a particular taxon will be included on the NPPA:

- The impact or potential impact of the plant.
- The effectiveness of the NPPA as a management tool for that taxon.
- The cost of including that taxon on the NPPA list (whether or not that taxon is valued for various purposes and what the cost would be to the horticultural trade or other groups if it was included on the NPPA list).

It is the role of the TAG to assess the first two factors (the third being the role of the Steering Group). The TAG process is outlined here.

The first stage of the assessment is effectively a weed risk assessment, considering factors such as invasiveness in New Zealand and overseas, presence of undesirable traits, ability to spread, competitive ability, impact on values (such as primary production or the function of natural ecosystems) and resistance to management. This first stage addresses the criteria under the Biosecurity Act (1993) for determination of an Unwanted Organism[1],

[1] Unwanted Organism means any organism that a Chief Technical Officer believes is capable or potentially capable of causing unwanted harm to any natural or physical resource or human health (Biosecurity Act 1993).

because if it doesn't meet these criteria, there is no legal basis for including it on the NPPA list.

If a taxon is considered to have a substantial impact as a weed in New Zealand, or it is considered likely to have a substantial impact in the future, then the second question is whether the NPPA is the correct tool for managing that taxon. This factor considers appeal as a cultivated plant, the difference between current and potential distribution in New Zealand, the current control approaches and the management status.

Available weed risk assessment systems

For decision makers, a system that gave a score to enable prioritizing was desirable. There are a number of existing weed risk assessment tools available in New Zealand and these were considered for use in the NPPA assessment process.

The weed risk assessment model of Williams (1996) is based on the Australian weed risk assessment model (Pheloung 1995). The model was developed to screen new plant imports and does not consider the management benefit from controlling a particular taxon using a particular management strategy. Three assessment systems were designed specifically for assessing weeds based on their impact on conservation values (Owen 1997, Williams *et al.* 2002, Williams and Newfield 2002, Williams *et al.* 2004). Because the NPPA includes all weeds that may be transported through the horticultural trade, including those that affect primary production or human health, the systems developed for conservation use were not suitable. The model developed by Champion and Clayton (2000) is used for assessing aquatic weeds and is therefore not relevant for terrestrial plants.

None of the available risk assessment or prioritization tools was designed to answer the specific questions required for the NPPA and none would give a score that represented the management benefit of including a taxon on the NPPA list.

Assessment and prioritization

A process was developed that would use the experience of the TAG members, information from the various weed risk assessment tools and peer review of assessments within the TAG. Each of eight TAG members was allocated taxa within their area of expertise to assess against a series of questions based on the criteria in Champion (2005). Scores for the weed risk assessment model (Williams 1996) and where relevant the aquatic weed risk assessment model (Champion and Clayton 2000) were available for most taxa and were included as supporting information. These scores were particularly relevant to taxa which have not yet become a significant problem but were nominated for inclusion on the NPPA list because of their potential as weeds.

Individual TAG members assigned their allocated taxa to one (or occasionally more) of six categories based on the criteria in Champion (2005) (see Table 1). The completed assessments were then sent to all other TAG members for comment.

Following the initial assessment and comments, the TAG met to discuss taxa classified as uncertain and those where opinions differed. Following the discussions, taxa were allocated to five categories (see Table 2). These were the TAG's recommendations to the Steering Group.

Final NPPA list

The 2006 NPPA list contained 109 taxa at species level or below, and four genera. In four cases, hybrids of NPPA taxa were also included, but hybrids of NPPA taxa are normally not considered to be included on the NPPA. Three more taxa were added in 2007 and seven more in September 2008. The delay in listing some taxa was to allow phase-out of stock by nurseries. Some high and medium priority taxa recommended for inclusion by the TAG were not included because although they met the first two criteria they did not meet the Steering Group's criteria for costs relating to their inclusion. Many low priority taxa were not included. The final list is given in Appendix 1.

Where to from here?

The NPPA specifies that the list will be reviewed every five years, so the next review is scheduled for 2011. It is not expected that all the current NPPA taxa will need to be reassessed.

Two particular areas have been identified for improvement for the next round of the NPPA. The first is how to better incorporate an assessment of current and potential distribution into the NPPA assessment process. While there are tools and approaches for assessing potential distribution (for example CLIMEX, Sutherst *et al.* 2007), the time and resources were not available to use these tools within the NPPA assessment process. For some taxa the available information was so limited that even if the time and resources were available, it may have been difficult to find the information required to use models such as CLIMEX. The second area was assessing taxa where there is some evidence that certain cultivars are less invasive than the wild type of the species. Under the Biosecurity Act (1993) all subspecies and cultivars are included when a species is listed on the NPPA, unless specifically excluded. Apparently sterile cultivars are sometimes excluded from the NPPA on the rationale that they are not invasive. There are no criteria to evaluate cultivar weed potential compared to the parent species but suitable criteria are currently being developed.

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Table 1. Categories to which assessed taxa were assigned by TAG members at the first stage of the NPPA assessment process.

Category	Number of taxa
Include on NPPA as high priority	83
Include on NPPA as medium priority	48
Include on NPPA as low priority	22
Uncertain needs discussion	11
Uncertain needs more information	5
Don't include on NPPA	21
Not assigned to one of the above categories	10
Total	200

Table 2. Categories to which assessed taxa were assigned by the TAG at the end of the NPPA assessment process.

Category	Number of taxa
Include on NPPA as high priority	82
Include on NPPA as medium priority	51
Include on NPPA as low priority	28
No but reassess next round	11
No	28
Total	200

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Appendix. List of taxa on the NPPA list, September 2008.

Scientific name	Common name
Acmena smithii	monkey apple
Ailanthus altissima	tree of heaven
Akebia quinata	akebia
Alternanthera philoxeroides	alligator weed
Anredera cordifolia	Madeira vine
Araujia sericifera	moth plant
Aristea ecklonii	aristea
Arundo donax	giant reed
Asparagus asparagoides	smilax
Asparagus densiflorus (excluding cultivar Meyeri/Myersii)	bushy asparagus
Asparagus scandens	climbing asparagus
Berberis darwinii	Darwin's barberry
Bomarea caldasii	bomarea
Bomarea multiflora	bomarea
Bryonia cretica	white bryony
Calluna vulgaris (excluding double-flowered cultivars)	heather
Cardiospermum grandiflorum	balloon vine
Cardiospermum halicacabum	balloon vine
Carpobrotus edulis and hybrids	iceplant
Celastrus orbiculatus	climbing spindleberry
Ceratophyllum demersum	hornwort
Cestrum parqui	green cestrum
Chrysanthemoides monilifera	boneseed
Clematis flammula	clematis
Clematis vitalba	old man's beard
Cobaea scandens	cathedral bells
Cortaderia jubata	purple pampas grass
Cortaderia selloana	pampas grass
Cotoneaster simonsii	Khasia berry
Cotyledon orbiculata	African pig's ear
Crassula multicava	fairy crassula
Cyathea cooperi	Australian tree fern
Dipogon lignosus	mile-a-minute
Drosera capensis	Cape sundew
Eccremocarpus scaber	Chilean glory creeper
Egeria densa	oxygen weed
Ehrharta villosa	pyp grass
Eichhornia crassipes	water hyacinth
Eomecon chionantha	snow poppy
Equisetum all species	horsetail
Eragrostis curvula	African love grass
Erigeron karvinskianus	Mexican daisy
Euonymus japonicus	Japanese spindle tree
Ficus rubiginosa	Port Jackson fig
Fuchsia boliviana	Bolivian fuchsia
Galeobdolon luteum	aluminium plant
Gunnera tinctoria	Chilean rhubarb
Gymnocoronis spilanthoides	Senegal tea
Hedychium flavescens	yellow ginger
Hedychium gardnerianum	kahili ginger
Heracleum mantegazzianum	giant hogweed
Hieracium all species	hawkweed
Homalanthus populifolius	Queensland poplar
Homeria collina	Cape tulip
Houttuynia cordata	chameleon plant
Hydrilla verticillata	hydrilla
Hydrocleys nymphoides	water poppy
Hypericum androsaemum	tutsan
Ipomoea indica	blue morning glory
Iris pseudacorus	yellow flag

Jasminum humile	Italian jasmine
Lagarosiphon major	oxygen weed
Lantana camara	lantana
Ligustrum lucidum	tree privet
Lilium formosanum	Formosa lily
Lonicera japonica	Japanese honeysuckle
Ludwigia peploides subsp. *montevidensis*	primrose willow
Lythrum salicaria	purple loosestrife
Macfadyena unguis-cati	cat's claw creeper
Menyanthes trifoliata	bogbean
Myoporum insulare and hybrids	Tasmanian ngaio
Myrica faya	fire tree
Myricaria germanica	false tamarisk
Myriophyllum aquaticum	parrot's feather
Nassella all species	
Nephrolepis cordifolia	tuber ladder fern
Nuphar lutea	yellow water lily
Nymphaea mexicana	Mexican waterlily
Nymphoides geminata	marshwort
Nymphoides peltata	fringed water lily
Ochna serrulata	Mickey Mouse plant
Osmunda regalis	royal fern
Panicum maximum	Guinea grass
Passiflora caerulea	blue passionflower
Passiflora tarminiana	northern banana passionfruit
Passiflora tripartita	banana passionfruit
Pennisetum all species	
Phragmites australis	phragmites
Pinus contorta	lodgepole pine
Pistia stratiotes	water lettuce
Pittosporum undulatum	sweet pittosporum
Plectranthus ciliatus	blue spur flower
Polygala myrtifolia (excluding 'Grandiflora')	sweet pea shrub
Potamogeton perfoliatus	clasped pondweed
Prunus serotina	rum cherry
Pyracantha angustifolia	firethorn
Reynoutria japonica and hybrids	Asiatic knotweed
Reynoutria sachalinensis and hybrids	giant knotweed
Rhamnus alaternus	evergreen buckthorn
Rhododendron ponticum	rhododendron
Sagittaria montevidensis	arrowhead
Sagittaria platyphylla	sagittaria
Sagittaria sagittifolia	arrowhead
Salix cinerea	grey willow
Salix fragilis	crack willow
Salvinia molesta	salvinia
Schinus terebinthifolius	Christmas berry
Schoenoplectus californicus	Californian bulrush
Selaginella kraussiana	selaginella
Solanum marginatum	white-edged nightshade
Solanum mauritianum	woolly nightshade
Tradescantia fluminensis	wandering Willie
Tropaeolum speciosum	Chilean flame creeper
Tussilago farfara	coltsfoot
Typha latifolia	great reedmace
Utricularia arenaria	bladderwort
Utricularia gibba	bladderwort
Utricularia livida	bladderwort
Utricularia sandersonii	bladderwort
Vallisneria gigantea	eelgrass
Vallisneria spiralis	eelgrass
Zantedeschia 'Green Goddess'	green goddess
Zizania latifolia	Manchurian wild rice