
**Evaluation criteria for assessment of
candidate species for inclusion in the
National Pest Plant Accord**

**NIWA Client Report: HAM2005-027
March 2005**

NIWA Project: MAF05204

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Prepared for

Biosecurity New Zealand

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Executive Summary

The National Pest Plant Accord (NPPA) is a cooperative agreement between regional councils and government departments with biosecurity responsibilities to prevent the sale and/or distribution of specified pest plants within New Zealand.

This report commissioned by Biosecurity New Zealand develops a draft framework for the Technical Advisory Group (TAG) to determine which plant taxa should be included on the NPPA, including evaluation criteria for the NPPA to address the level of impact and associated risk to economic, health, environmental and cultural values and effectiveness and efficiency of this designation in supporting management objectives and intervention. The report also discusses regulatory impacts including technical justification for/relevance of intervention at the border. This report follows the criteria outlined in the Biosecurity Integrated Risk Management Assessment Framework (IRMF), developed and adopted by central government biosecurity management agencies in 2004.

The rationale for inclusion on the NPPA list is that plants of limited distribution within New Zealand, that have major deleterious impacts and are difficult to control once established may be prevented from further distribution, where deliberate distribution by human activities would increase their potential range and level of impact. The designation of plants on the NPPA as unwanted organisms allows for management provisions resulting from Sections 52, 53 and 100 of the Biosecurity Act (1993) to be enforced (prevention of sale and/or distribution throughout New Zealand and provision to manage a new incursion on a regional basis). However, unwanted organism status is also used by the Ministry of Agriculture and Forestry to justify an “official control programme” for contaminant organisms intercepted at the border. The implications of NPPA status of pest plants on this and other regulatory impacts require assessment by Biosecurity New Zealand.

Application of the weed risk assessment models (WRA) to candidate plant taxa provides a score or ranking allowing comparison of the weedy potential of that plant with others and, from this comparison, the determination of taxa for inclusion on the NPPA list. For the NPPA to be an effective and efficient method to manage plants that may be sold and/or distributed in New Zealand, other characteristics need to be considered in addition to their WRA score. These include current and potential distribution/abundance, appeal as a cultivated plant and management/control considerations. The TAG is provided with a framework and criteria, outlined in this report, to make a series of value judgements to determine if pest plants should be included on the NPPA list.

1. Introduction

The National Pest Plant Accord (NPPA) is a cooperative agreement between regional councils and government departments with biosecurity responsibilities. Under the accord, regional councils will undertake surveillance to prevent the commercial sale and/or distribution of an agreed list of pest plants (Biosecurity New Zealand 2001).

The purpose of the accord is to prevent the sale and/or distribution within New Zealand, of specified pest plants. It is intended as a way of building upon the initiative previously provided by the National Surveillance Pest Plant List, under which councils provided surveillance for a list of plants based on a mutual agreement to include them as pests in their respective regional pest management strategies.

The focus of the accord is the accord list, a list of pest plants that have been determined as unwanted organisms under the Biosecurity Act (1993). This will ensure that sections 52 and 53 of the Act apply to the plants nation-wide, as opposed to applying only to certain regions dependent upon their inclusion as a pest within a regional pest management strategy. Furthermore, it removes the need for councils to analyse these plants against the criteria in sections 72 and 77 of the Act. Accordingly, there is no requirement that the plants on the accord list be included in a council's regional pest management strategy to enable enforcement of sections 52 and 53.

The accord provides for the establishment of a technical advisory group (TAG) to provide advice to the accord parties on amending and updating the accord list. It is anticipated that the technical advisory group will provide a forum for discussion on issues directly impacting upon implementation of the accord. The roles of the technical advisory group will include providing advice and recommendations to the accord parties on amending and updating the accord list. In particular, the technical advisory group will consider whether pest plants should be determined as unwanted organisms and entered on the accord list, whether pest plants that are determined as unwanted organisms independently of the accord should be entered on the accord list, review and develop advice on proposals from other sources for plants to be added to or removed from the accord list.

Biosecurity New Zealand has contracted NIWA to develop a draft framework for the TAG to determine which plant taxa should be included on the NPPA, based on the criteria outlined in the Biosecurity Integrated Risk Management Assessment Framework (IRMF), developed and adopted by central government biosecurity

management agencies (anon. 2004). This includes evaluation criteria for the NPPA to address:

- a) Level of impact and associated risk to economic, health, environmental and cultural values.
- b) Effectiveness and efficiency in supporting management objectives and intervention.
- c) Regulatory impacts including technical justification of intervention at the border.

These criteria should enable the current NPPA list and proposed additions to the list, to be assessed by the TAG following the IRMF decision-support components identification, assessment and prioritisation of pest plants.

2. The rationale for the National Pest Plant Accord

Each plant included on the NPPA is also declared as an Unwanted Organism (UO), although not all UO plants are included on the NPPA. UO status provides many benefits to manage those potential weed species that are notoriously difficult to control once they establish naturalised populations.

The Biosecurity Act (1993) outlines key criteria for the determination of an UO:

- The species must be capable of forming self-sustaining populations in New Zealand.
- The species must have potential to cause adverse impacts to economic, health, environmental and/or cultural values.

The majority of problem plant species have been intentionally introduced, or are currently traded in other parts of the world as ornamental garden or aquarium plants. Many do not reproduce sexually, or have limited reproductive output and therefore would predominantly be dispersed by deliberate or unintentional transfer by human activities. Therefore the prevention of sale and/or distribution (Sections 52 and 53 of the Biosecurity Act) is an effective mechanism to circumvent their dispersal around New Zealand. In 1983, six aquatic weed species were banned from sale and distribution under the Noxious Plant Act (1978) and this has effectively limited their deliberate movement and reduced the number of potential sources for new weed incursions into natural water bodies. Following this “Forest Friendly Awards” and “the National Surveillance Pest Plant List” expanded this idea to include terrestrial plants and the current NPPA list comprises 92 plant taxa, 34 of which are aquatic.

As some species are yet to be detected within New Zealand, their determination as UO effectively signals the weed potential of those species to the agencies policing the importation of plant material. This point is further discussed in Section 4.2.1.

Publication of information on the identification and recognition of UO through the NPPA will increase the probability of detection of these plants prior to their escape and naturalisation. This may also reduce the public desirability of such species that have attractive growth features such as showy flowers, and attractive foliage, again reducing the number of potential sources for new incursions of these plants. The public education benefits of including pest plants on the NPPA and consequent

changes in public perception of these species is not considered further, or as a “stand-alone” basis for the TAG to consider candidate species for inclusion on the NPPA list.

Any new incursion of an UO into an area where the species is not a current plant pest under a Regional or National Plant Pest Strategy allows the potential management of that incursion under the powers of Section 100 of the Biosecurity Act. Action may be taken without the need for its inclusion into a Pest Management Strategy.

The UO status of NPPA plants has implications for international trade under the International Plant Protection Convention (IPPC) for the International Standards for Phytosanitary Measures (ISPM). The implications of NPPA status of pest plants on this and other regulatory impacts require assessment by Biosecurity New Zealand.

The two criteria that must be met when determining UO status and subsequently candidate species for the NPPA are the ability of the plant to naturalise and cause adverse effects within New Zealand. These are discussed in the following sections.

2.1 Is the plant species capable of forming self-sustaining populations in New Zealand?

Species that have indigenous and naturalised ranges solely in tropical habitats are likely to pose a low risk of naturalising within New Zealand, apart from within geothermally heated areas which provide suitable temperatures. For example, one of the two known populations of water lettuce (*Pistia stratiotes*) was found in thermally heated water in the Bay of Plenty.

Climate models (Sutherst & Maywald 1985; Kriticos and Randall 2001) offer the possibility to determine potential habitat of a tropical species within New Zealand. However, microclimate variability, and the capacity of some (especially aquatic) habitats to ameliorate temperature extremes, are possibly the reason why some exclusively tropical species not only establish but also become problematic under New Zealand conditions. Species with a weed history in tropical countries should therefore be evaluated either experimentally for cold temperature tolerance, or from evidence of weediness in other temperate countries. The weedy behaviour of a plant in other countries is the best predictor of weed potential of a plant introduced in a new country (e.g. Scott & Panetta 1993).

2.2 Does the plant have the potential to cause adverse impacts?

Arguably any plant (indeed any organism) that has naturalised within New Zealand has in some way adversely impacted on some part of our indigenous or modified ecosystems through:

- displacement of what was previously present at the site of its naturalisation;
- modification of food-webs built around what has been displaced;
- competition for resources that would have been available for indigenous or other desirable species.

Additional impacts such as toxicity to humans or livestock and cultural impacts may also occur, in some cases even before naturalisation.

Clearly not all introduced species would warrant UO status, and it would be unacceptable to most people to attempt this. Determination of an UO and its inclusion on the NPPA will be dependent on what benefit would be achieved by providing access to Biosecurity Act powers in terms of enhancing management. So an attempt to define significance of adverse impact must be attempted (see Section 3).

3. Assessment of weed risk and important factors relating to the NPPA

The range of effects of potential NPPA plants is summarised in the IRMF report table below:

<i>Sectors</i>	<i>Effects</i>
<ul style="list-style-type: none"> ○ commercial (including primary production, industry, service sectors) ○ environmental (including valued indigenous and introduced species, biological systems, biodiversity) ○ social (including personal property, lifestyle) ○ human health and well-being ○ Māori cultural and spiritual values ○ public (in terms of Crown resources) 	<ul style="list-style-type: none"> ○ positive and negative (including averted impacts of the organism, additional costs or forgone opportunities to affected sectors) ○ direct and indirect (with regard to the risk management objective, incorporating the responses of affected sectors, with care to avoid double-counting) ○ tangible and intangible ○ short and long-term (recognising the dynamics of biological and economic systems) ○ incorporating probability (such as of entry, establishment, spread of organism, domestic or export market reaction, success) ○ incorporating relative timing ○ with regard to need for and costs and benefits of managing other biosecurity risks

The TAG will consider effects on all of these sectors using the prioritisation criteria and score definitions from IRMF as outlined in Table 1. A weed risk assessment approach is proposed (see Section 3.1) to compare the weed potential of the candidate plants.

Table 1. Prioritisation criteria and score definitions

Criteria	Considerations
Technical	<ul style="list-style-type: none"> - feasibility - suitability - probability of success (if not incorporated into benefit-cost)
Practicality	<ul style="list-style-type: none"> - logistics - resourcing (including current capability, extent to which ability to manage other risks would be constrained) - timing (including urgency, time awaiting action) - opportunities and risks associated with the risk management option (including consideration of risks in deferring or rejecting the risk management option if not incorporated into benefit-cost) - past achievements and sunk costs - stability (including the need for security in committing resources to long-term programmes, maintenance of basic capability, rate-of-change constraints)
Benefit-cost	<ul style="list-style-type: none"> - net impact of the risk management option, most directly reduction in risk achieved net of the resources required (encompassing the full range of positive and negative effects across all sectors incorporating probability and timing, impact on costs and benefits of managing other biosecurity risks), based on cost-benefit analysis
Strategic	<ul style="list-style-type: none"> - contribution to or alignment with goals and key priorities (for New Zealand biosecurity, of the government, agency, sector, group) - long-term benefits (including development of capability, potential future growth sectors) - synergy (including support for the objectives and achievements of other risk management options if not incorporated into benefit-cost, whether conditional on or in conflict with management of other risks) - coverage (in terms of contribution to the range of risks managed)
Acceptability	<ul style="list-style-type: none"> - stakeholder interest or concern (including other government agencies, the public) - responsiveness to the needs of Māori - international interests (including trade, environmental, human health) - distributional considerations (including the interests of particular groups and incidence of costs and benefits) - risk preferences under uncertainty (including according to risk type and characteristics)

Scores	Definitions	Scores	Definitions
1	Unsatisfactory	6	Medium
2	Poor	8	Good
3	Low	9	High
4	Modest	10	Excellent
5	Moderate		

3.1 Weed Risk Assessment

Weed Risk Assessment (WRA) is a relatively new discipline that may be used to assist in predicting the potential invasiveness, impacts and distribution of introduced plants (Groves et al. 2001). Several WRA models have been developed for New Zealand (e.g., Esler et al. 1993; Williams 1996; Champion 1995; Owen 1998; Champion and Clayton 2000; Williams et al. 2002; Williams and Newfield 2002; Williams et al. 2004) and these have been, or are currently used to determine which plants are permitted for importation, screening and prioritising species for UO status and inclusion in Regional Pest Management Strategies. These models use a range of characters perceived to relate to the probability that a plant will become weedy in New Zealand, including:

- Whether the plant is weedy or has naturalised in other countries with similar climates.
- Weediness of its cogeners (members of the same genus or family)
- Whether the plant produces undesirable traits (e.g., poisonous, spiny, creates a fire hazard, obstructs access etc.)
- Reproductive (seed) output, vegetative propagation and propagule dispersal, including human spread.
- Competitive ability and persistence.
- Impact on natural systems and tolerance to environmental variables.
- Resistance to management practices.

Application of the models to candidate plant taxa provides a score or ranking allowing comparison of the weedy potential of that plant with others and, from this comparison, the determination of species requiring management action. Therefore appropriate models are already available to determine the weed potential of a plant selected for inclusion in the NPPA, although continued refining and upgrading of these models can be anticipated.

Regardless of the assessment system used, the criteria used to evaluate weed risk provide a transparent justification for inclusion of plants on the NPPA outlining their deleterious impacts and from the use of WRA a ranked list of candidate taxa for NPPA inclusion can be made.

3.2 **Effectiveness and efficiency in supporting management objectives and intervention**

For the NPPA to be an effective and efficient method to manage plants that may be sold within the nursery or aquarium trade a range of characteristics (both of the plant and its appeal as an ornamental plant) need to be considered in addition to their WRA score (Section 3.1).

The following characteristics of plant taxa should be considered in their determination for NPPA status:

- abundance in New Zealand (potential versus current distribution);
- appeal as an ornamental garden or other purpose for cultivation;
- ease of control and current pest status.

These characteristics are all utilised as part of the weed risk assessment process, however, their importance in determination of NPPA status warrants additional consideration. As with the WRA criteria, the assessment of these characteristics need to be transparent in order to justify inclusion on the NPPA.

3.2.1 **Appeal as a cultivated plant**

Species currently cultivated and dispersed within garden or aquarium trade/hobby groups have greater potential to establish as they are potentially distributed throughout the country in large numbers and form the **main rationale for the NPPA**. Other plants are or have in the past been cultivated/distributed for a range of other purposes including culinary and medicinal plants, pastoral or silvicultural purposes and for erosion control. Assessment of plants potentially dispersed by all of these distribution mechanisms need to be considered equally.

In the case of ornamental plants, managing the risk of further spread is dependent on the current and past availability of that plant within the nursery/aquarium trade and the

abundance/distribution of it within gardens/aquaria. Prevention of sale and/or distribution of plants that are uncommon within New Zealand gardens/aquaria would provide greatest benefits. If a plant were already abundant and widely distributed throughout gardens in New Zealand then prevention of further spread would achieve little in the management of its spread. Likewise, if a plant has little or no appeal as an ornamental garden plant and is not grown as such then its inclusion on the NPPA would provide little management value.

Determination of appeal as a cultivated plant may be ascertained by quantifying the current trade in that plant (sales), or the number of trade outlets offering that plant (e.g. Gaddum 1999). However, plants already listed on the NPPA or other UOs are currently banned from sale, propagation and distribution in New Zealand but removal of this status may result in their future sale. For example *Vallisneria spiralis*, originally listed as “Meola Creek variety” and banned from sale under the Noxious Plant Act 1998 was not included in the NPPA and has become a popular plant in large show aquaria displayed in doctor’s surgeries etc. Also plants of limited distribution could become more widespread through future promotion as garden plants etc. Assessment of international trade of these plants would give some indication of dispersal potential, but newly imported plant species with no previous cultivation history would not be able to be assessed in this way.

3.2.2 Abundance in New Zealand

Species that have been eradicated from New Zealand including those initiated and achieved under previous legislation automatically qualify for UO. This is because they are regarded as New Organisms under the Hazardous Substances and New Organisms Act (HSNO) (1996) and further deliberate importation into New Zealand would not be permitted. Likewise other potential weed species with UO status, but are not known to occur in New Zealand would not be permitted entry. Thus there would not appear to be any management value in including such species on the NPPA. However, Champion and Clayton (2001) and Clinehans (2004) have discussed how the current system of evaluating organisms for import under HSNO has triggered non-compliance with illegal importation short-circuiting this process. A recent survey reported in Champion et al. (2004) has demonstrated the presence of the current NPPA plants *Sagittaria sagittifolia* and *Typha latifolia* in New Zealand. At the time the NPPA was established neither species was known to be present within New Zealand. Thus it may be advantageous to include high-risk plant taxa not currently known within New Zealand on the NPPA (or another similar list) to facilitate their early detection should they enter this country in the future.

The lower the incidence of a potential weed species within New Zealand, the greater the potential gain from determination as an UO, through prevention of further spread (stopping sale, distribution and propagation) and active (regional or national) management (see section 3.2.3). Perhaps the greatest effectiveness would be preventing the distribution of species that had yet to naturalise or were only known from a few naturalised sites.

Distribution of plants through deliberate spread increases the potential for long-distance dispersal of founding populations rather than usually local dispersal by other means. Thus there are still benefits in preventing sale, distribution and propagation provided that that taxon is not fully dispersed within its potential naturalised range.

3.2.3 Ease of control /Current pest status

Control or eradication of plant taxa is dependent on several factors including ease of detection, ease of access to the plant, available control/eradication techniques and acceptability of control methods and need to control to the community. The more difficult control of established populations of a plant is, the higher the priority to stop a species establishing and therefore inclusion in the NPPA would be beneficial. However, once widely established, this benefit would significantly decrease.

Biological control is often seen as a desirable method of control for environmental weeds that are difficult to control by other methods. In order to make a case for research on taxa requiring biological control, the candidate plants usually are required to have UO status (J. Craw pers. comm.) and several current NPPA plants are examples of this (e.g. moth plant, *Araujia sericifera*).

In addition to available methods for control as discussed above, the current management of candidate plants need to be addressed. There are three levels of management considered here:

Official control

Any plants included in a National or Regional Pest Management Strategy with a requirement for the land owner or an agency to control that plant would be considered under official control.

Plants that are managed throughout New Zealand by a central authority by a national management plan or equivalent (e.g., the Notifiable Organisms *Homeria collina* and

Eichhornia crassipes) are already subject to prevention of further spread (stopping sale, distribution and propagation) and personnel recognising such plants are duty bound to report any discovery of such plants and should be included in the NPPA.

Plants managed on a regional basis either by regional or unitary authorities or by Department of Conservation under a Regional Plant Pest Management Strategy usually prevent sale, distribution and propagation of that organism within that region. However, no other region is duty bound to prevent sale and distribution and therefore the pest plant may be legally distributed in other areas. This has a major potential to compromise current management programmes by continued re-infestation of that plant from outside of the region. Thus the National Surveillance Pest Plant List and now the NPPA provides a mechanism to prevent the sale of species currently managed regionally on a national basis. To be of value those plant taxa should be or have the potential to be distributed by the mechanisms discussed in section 3.2.1. For example ragwort (*Senecio jacobea*) management is often enforced under RPMSs but as the species is unlikely to be distributed through deliberate trade its inclusion in the NPPA is not advocated.

Active but not official control

Many plants not included in Plant Pest Management Strategies are still actively controlled by management agencies (eg DOC and local authorities) in specific areas (defined by DOC as site-led control). Often these plants are widely distributed and control is carried out to protect a resource (e.g. an endangered species or to maintain road visibility).

Not under active control

The lack of any control activities on a plant may relate to several reasons including its lack of perceived impact on economic, health, environmental and cultural values in the habitats where it occurs. This could either be due to its inherent lack of weedy characters or that it has sparingly or not naturalised in sites where impact is likely (e.g. with a current distribution in urban waste areas where there are few values threatened). Another reason might be the lack of effective control methodologies for that plant as discussed at the beginning of this section. In this case or in the case of newly naturalised species of high weed potential but without current control, the priority should be on preventing establishment and inclusion on the NPPA would be beneficial.

3.2.4 Synthesis

Once the potential of a plant taxon to cause significant deleterious impacts has been established and ranked against other plants using a weed risk assessment model then the effectiveness and efficiency of management derived from prohibiting sale and/or distribution depends on the stage at which a species has established within New Zealand along with several characteristics of the plant as discussed in the previous sections. These characters are inter-related and must be considered together to decide the appropriateness and expediency of including that plant on the NPPA list.

The benefits of preventing sale and distribution are greatest for plants that are limited in their distribution within New Zealand. When a plant is either not naturalised or only sparingly so, the benefits are greatest for a taxon, which is likely to be dispersed by natural agents and is difficult to control once established. The window of opportunity for eradication of such a plant is limited to this early phase of establishment because once founder populations have formed then management of consequent spread is increasingly unlikely to be achieved over time. However, deliberate spread via sale and distribution can lead to long-distance dispersal and considerably reduce the time taken for a plant to colonise all of its potential range, compared to spread by natural and accidental means.

Taxa that are dependant on human activities for dispersal can be effectively managed by preventing sale and distribution even if they are already well established as naturalised populations in some areas of New Zealand. The benefits accrued by preventing deliberate spread are related to the level of impacts avoided and the values of the areas protected from invasion.

Thus the TAG has to make a series of transparent value judgements based on the criteria discussed in this section in order to consider whether pest plants should be included on the NPPA list. Although individual species will be scored and ranked using the WRA and additional criteria, these rankings should not be presented with the NPPA list as this would infer that some higher ranked taxa should be afforded more management resources than lower ranked plants on the Accord. The following process outlined in Figure 1 is proposed as a framework on which the TAG should base their recommendation.

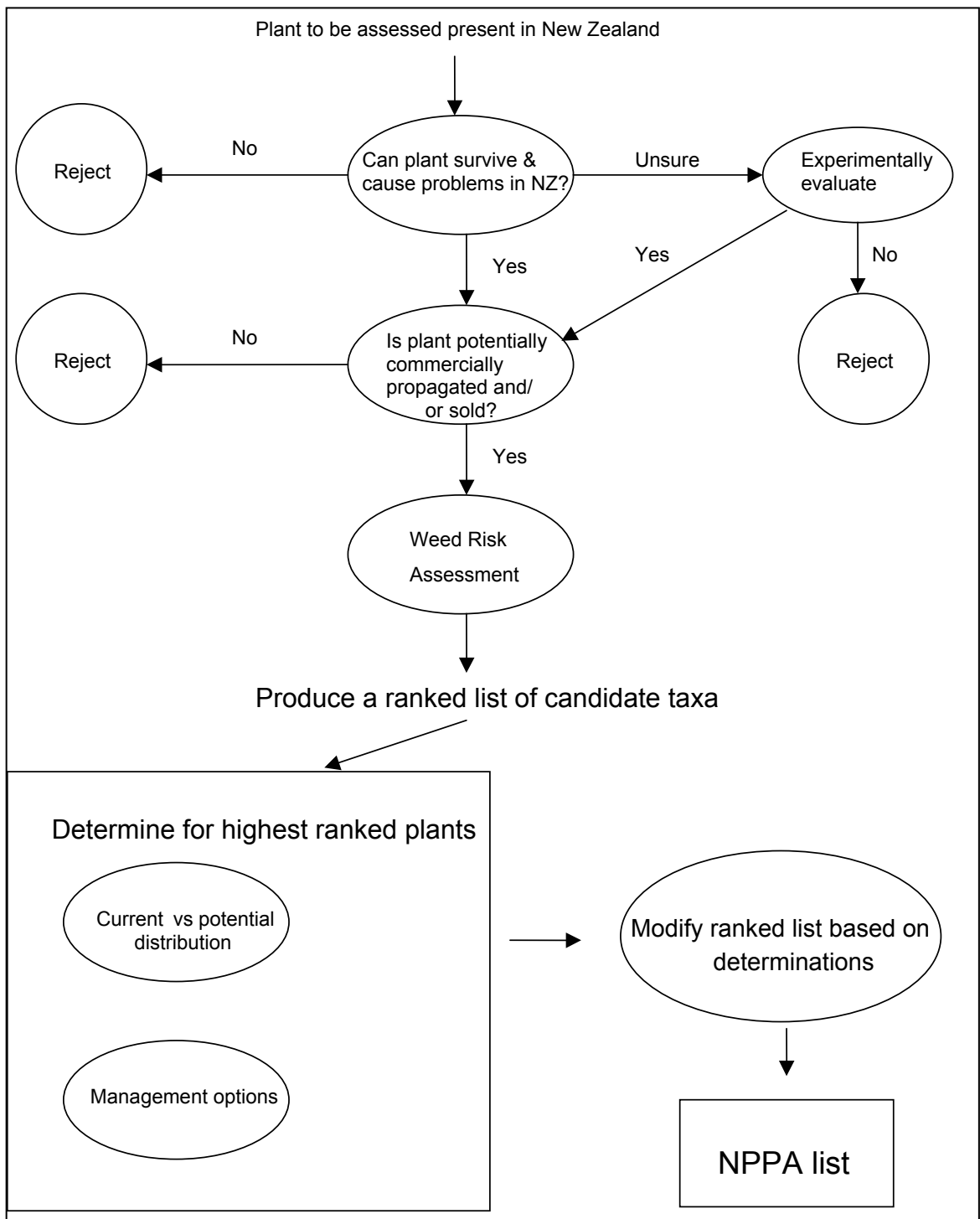


Figure 1: Flow diagram illustrating assessment criteria for inclusion of plant taxa onto the National Pest Plant Accord.

4. Review of NPPA designation

Often the information available on the biology, ecology, weedy tendencies and distribution details of a newly naturalised plant, or species assessed for importation is either lacking, or limited. The assessment for NPPA status is thus based only on information available at that time. It is therefore important to have regular reviews of species either accepted or rejected for NPPA status based on further information on plant distribution and/or weed impact that may change any of the parameters outlined in Section 3.

5. Acknowledgements

I would like to thank John Clayton (NIWA), Peter Williams (Landcare Research), Jack Crow (Auckland Regional Council), Melanie Newfield, Andrew Harrison, Christine Reed and Barney Stephenson (Biosecurity New Zealand), and Joanne Perry, Sonya Bissmire and Clayson Howell (DOC) for useful discussions and helpful ideas relating to this report.

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