

Locally Threatened Plants in Manningham

Report by Dr Graeme S. Lorimer, Biosphere Pty Ltd, to Manningham City Council

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Executive Summary

A list has been compiled containing 584 plant species that have been credibly recorded as indigenous in Manningham. 93% of these species have been assessed by international standard methods to determine whether they are threatened with extinction in Manningham. The remaining 7% of species are too difficult to assess within the scope of this project.

It was found that nineteen species can be confidently presumed to be extinct in Manningham.

Two hundred and forty-six species, or 42% of all indigenous species currently growing in Manningham, fall into the 'Critically Endangered' level of risk of extinction in the municipality. This is an indication that if current trends continue, scores of plant species could die out in Manningham over the next decade or so – far more than have become extinct since first settlement.

Another 21% of species fall into the next level down on the threat scale ('Endangered') and 17% fall into the third ('Vulnerable') level. The total number of threatened species (i.e. in any of the aforementioned three levels) is 466, representing 82% of all indigenous species that are not already extinct in Manningham.

These figures indicate that conservation of indigenous flora in Manningham is at a critical stage. This also has grave implications for indigenous fauna.

Nevertheless, corrective measures are possible and it is still realistic to aim to maintain the existence of every indigenous plant species presently in the municipality.

The scope of this study has not allowed much detail to be provided about corrective measures except in the case of protecting threatened species under the Manningham Planning Scheme. A set of species has been selected for special treatment when Council considers planning permits for removal of native vegetation (identified by ticks in the first column of the table beginning on page 17). If any of the selected species are among those proposed to be removed, it is recommended that Council:

- See whether harm to those species can be avoided or reduced; and
- Apply permit conditions that provide appropriate compensation for harm to those species, such as planting of replacements or protection of retained plants from pests.

1. Project Scope

This is a report on an investigation to determine which plant species in Manningham are threatened with extinction in the municipality, using the international standard criteria of the International Union for Conservation of Nature. The purpose of the investigation is given in Section 2.

93% of Manningham's indigenous species of flowering plants and ferns have been assessed, amounting to 545 species, subspecies and varieties. Nonvascular plants such as mosses, liverworts, algae and lichens have not been assessed. The project had budgeted for the inclusion of only those species that were most likely to meet international criteria for a locally threatened species, which was thought to be a small fraction of the total flora. However, closer investigation soon made it clear that hundreds of species are either locally threatened or extinct, including most species that were previously assumed to be secure. Rather than provide an unreasonably incomplete assessment of Manningham's threatened plant species, I kept going (at my own expense) to cover the 545 species. The unassessed species are difficult to fully assess for various reasons and most of them are likely not to be locally threatened.

It also became apparent during the project that a list of species and their threat ratings would not be enough to tailor appropriate responses to the plight of each threatened species. I have therefore expanded the project to provide additional guidance on which species are most appropriate for protection under the Manningham Planning Scheme. Further guidance on which species are most deserving of other actions, such as planting, burning or protecting from pest animals, is left for a future project.

This report contains the threat ratings of 545 species in Appendix A (page 17), but the underlying data and details of the assessment of each species are provided in a separate document of over 250 pages by the same author, titled '*Red List Assessments of Plant Species in Manningham*'. Appendix A also includes the names of species that have not been assessed, thereby making the appendix a complete inventory of indigenous vascular plant species in Manningham.

2. Purpose

Many of the species that appear on each Australian state's list of threatened flora and fauna are secure in other states or overseas. This is a reflection of the view that, while the highest level of protection and conservation effort should go to species threatened with global extinction, there are important reasons for a government to conserve species that are threatened only within its own geographical jurisdiction. Some of those reasons are that:

- As the number of species in any domain of interest reduces, the ecological system loses complexity and the web of interactions weakens;
- The extinction of a species from a jurisdiction represents a contraction of that species' range and thereby contributes to the extinction process at the global scale;
- Some species possess important genetic variation between jurisdictions, and it is desirable to conserve the full range of genetic variability;
- There is a philosophical viewpoint that we, as individuals, communities, organisations or governments, have a duty of care to do what is within our own sphere of influence to look after the environment, and not rely on others (such as another state) to compensate for environmental deterioration in our own jurisdiction.

Each of these principles applies to local government, including Manningham City Council, as much as to states or nations. Indeed, the first of the three concerns listed above becomes more serious as one focuses on smaller areas. The loss of even a small number of species from a municipality or district can have significant consequences and lead to a cascade of adverse flow-on effects. For example, the collapse of mistletoe numbers in Melbourne's eastern fringe over the past five years due to drought has led to a collapse in dependent species such as the

Mistletoebird and Imperial White Butterfly, and flow-on effects such as reduced pollination by butterflies and reduced pest control by Mistletoebirds. It is impossible to know to what extent the consequences have spread through the web of interactions that maintains the ecosystem in a productive and dynamically stable state.

As a system loses species it becomes less able to adapt to changes such as drought, fire, climate change or urbanisation. For example, conditions following bushfires in natural forests cause post-fire coloniser species to expand from tiny pre-fire populations to become abundant, temporarily taking over ecological functions that cannot be done by the same species as prior to fire. As conditions evolve, different combinations of species progressively come to the fore so that ecological functions can be maintained. This adaptability can break down if species required at some stage have become locally extinct, e.g. if the post-fire colonisers become locally extinct before the fire. Such changes are actually being observed in Manningham.

A particular concern is that large shifts in species' abundances have been observed in the past decade as a result of drying climate. Some species that were once scarce but capable of responding favourably to climate change are no longer able to do so because they have been made locally extinct or extremely localised. This could make the adverse effects of climate change worse than they would otherwise be.

Some species play more important or fundamental ecological roles than others, but in general, the greater the diversity of species that can be retained at the local or municipal scale, the better.

Sadly, the importance of this is rarely recognised and it has been generally overlooked by governments at all levels.

In Victoria, state government policies, legislation and regulation related to protection of native flora and fauna recognise species that are threatened with extinction throughout the state but not at smaller scales.

Local governments have very limited jurisdiction over wildlife but can use their planning schemes to specifically recognise locally threatened plants, provide some planning protection and specify planning permit conditions that require restitution for any harm to locally threatened plants. Councils can also support the survival of locally threatened flora and fauna species through targeted management of bushland reserves and by encouragement and incentives for conservation measures on private land.

But these measures can only be taken when it is known which species are locally threatened and to what degree. For species to be recognised in a planning scheme, it is important that their threatened status be scientifically defensible to planning panels and tribunals.

Therefore, the purpose of this report is to identify which plant species in Manningham are threatened with extinction in the municipality, using international standard criteria.

As explained later, it is also important to understand the causes and nature of each species' decline in order to decide the best response.

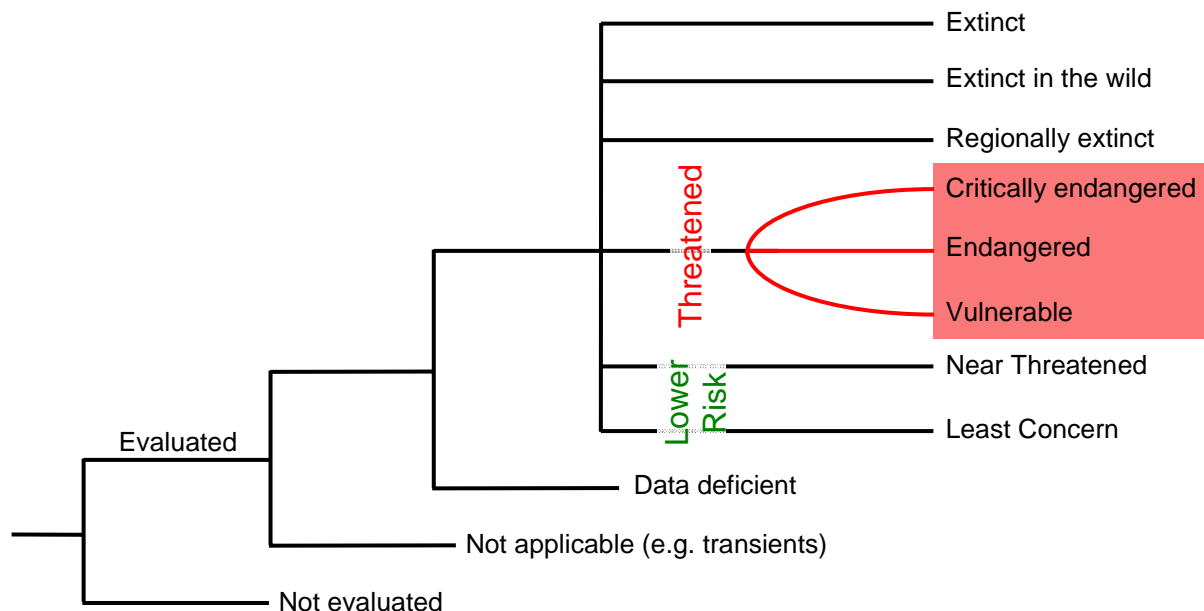
3. The IUCN ‘Red List’ Classification System

The international standard method for classifying the level of extinction risk faced by species is contained in the ‘Red List’ criteria and guidelines of the International Union for Conservation of Nature (IUCN 2001, 2003, 2008). In Victoria, this method has been applied by the Victorian Department of Sustainability & Environment for fauna (DSE 2007) and flora (in progress) and for the municipalities of Boroondara (Lorimer 2006) and Knox (Lorimer 2010).

3.1. The Categories

The hierarchy of ‘Red List’ categories is depicted schematically in Figure 1. There are three levels of extinction, three levels of ‘threatened species’ and two levels of ‘lower risk’.

Figure 1. Hierarchy of Red List regional conservation status categories (after IUCN 2003).



In simplified terms, any species that has at least a one-in-ten likelihood of becoming extinct from the domain of interest (Manningham, in this case) within one hundred years qualifies as Vulnerable under the Red List criteria. The category rises to Endangered if there is at least a one-in-five likelihood of extinction within a period of twenty years or five generations of the species (up to a maximum of one hundred years). The category rises to Critically Endangered if the likelihood of extinction rises to 50% within ten years or three generations (up to a maximum of one hundred years).

It is instructive to reflect upon changes in the native vegetation of Manningham since 1910 and the future changes that may arise over coming decades if recent trends in climatic conditions and land development continue as predicted. If these factors are understood, one should expect that a high proportion of indigenous plant species would meet the criteria for at least the ‘Vulnerable’ category.

3.2. The Criteria

The likelihood of a species becoming extinct within a fixed period is rarely quantifiable, so the Red List guidelines provide alternative criteria based on more reliably known parameters. For example, a species represented by less than fifty reproductively mature individuals in the domain of interest is deemed Critically Endangered unless immigration is expected to reduce the risk of local extinction.

The Red List Regional Guidelines (IUCN 2003) specify how to allow for immigration from outside the region of interest (i.e. Manningham in this case), because immigration is sometimes important for maintaining the local population of a species. The Regional Guidelines also indicate how to treat difficult cases such as flora or fauna species that make only transient appearances in the domain of interest without breeding or finding suitable habitat. (In such a case, the species would be given the classification, 'Not applicable'.)

A summary of the Red List criteria for threatened species and the method for taking into account cross-border effects are reproduced in Appendix B. They require knowledge of each species':

- Biology (particularly its breeding system);
- Longevity;
- Spatial distribution;
- Numbers of mature individuals capable of reproducing;
- Trends and fluctuations in population size; and
- Immigration rate and the breeding success of immigrants.

When the population is in decline or expected to decline, the Red List criteria take into account any information that may be available about the rate, cause or cessation of the decline.

A single species often falls into different categories of threat under different criteria. For example, a species may be 'Vulnerable' under criterion D because its total mature population is in the range 250-999 and 'Endangered' under criterion C2(ai) because the species is in decline and its largest subpopulation size is in the range 50-249. After assessing the species against all applicable criteria, a species is given the classification that represents the highest level of threat.

Information is often lacking for one or more of the criteria. If it is suspected that a shortage of information is resulting in the risk of local extinction being understated, the best that can be done is to indicate the result of the incomplete assessment and the possibility that it understates the threats. The 'Data Deficient' category is only for species that cannot be classified as threatened under any criterion due to lack of information.

Criterion B of the Red List Guidelines aims to recognise species at risk from small geographic ranges. It contains thresholds for a species' 'extent of occurrence', 'area of occupancy' and 'number of locations' that reflect risk factors for localised populations. Manningham's whole area of approximately 100 km² is smaller than most of the thresholds, so plant populations within Manningham automatically meet those thresholds regardless of any threats arising from geographic isolation. It could therefore be argued that criterion B is of dubious validity in such a small area. Consequently, criterion B has not been used in this study, but it makes

negligible difference because in nearly all cases, other criteria yield the same category or a more threatened category.

Criterion E has not been usable in this study because it requires the existence of a quantitative analysis of the probability that a species will be locally extinct within different durations. No such analyses are available for Manningham's flora.

3.3. Assessable Taxa

According to the Red List guidelines (IUCN 2008), the classification system can be validly used for formally described species, subspecies and varieties of plants. Undescribed species can be assessed only in special circumstances. Red List rules exclude the listing of hybrids and undescribed infraspecific taxa such as subspecies.

The Red List Regional Guidelines (IUCN 2003) specify that assessments should only be done for wild populations within the natural range of each species. Wild populations are taken to include self-sustaining populations arising from planting or release, but the term, 'natural range', excludes areas occupied only as a result of introduction.

Unfortunately, the IUCN's definition of 'natural range' is not specific about how to deal with ranges that are expanding. This can lead to substantial uncertainty in an age when flora and fauna are adapting to climate change.

The drought of recent years has resulted in substantial ecological shifts in native vegetation around metropolitan Melbourne. When a species first expands its range into Manningham, the Red List Regional Guidelines specify that its extinction risk should not be assessed until it has successfully reproduced for approximately ten consecutive years.

To exemplify the complexities that can arise in such cases, the first Wonga Vine (*Pandorea pandorana*) in Manningham appeared in (or about) 1993 and was initially given the protection of a fence around it. Numerous other Wonga Vines appeared in following years, breeding freely and often smothering plants that they climbed over. Some were then weeded out to protect the pre-existing native vegetation.

Complex philosophical and ecological questions arise about the extent to which new arrivals in Manningham should be regarded as natural and desirable responses to environmental change as opposed to invasions that should be resisted. The only contribution that I wish to make in this report is that these questions should be dealt with before anyone performs a Red List assessment on any recent arrival in Manningham.

4. Assessment Procedure

4.1. Information Sources

In this study, the primary sources of information about the sizes, areas, spreads and trends of species' populations were:

- Entries in the *Flora Information System* database, which is the central repository for botanical data in Victoria, managed by the Department of Sustainability & Environment;

- The authors' own records from ecological projects in Manningham in recent years, combined with data and observations of declines in plant species of Melbourne's eastern fringe during recent years of drought (e.g. Lorimer 2007);
- Information from Warrandyte and surrounding localities compiled since the early 1990s for the *Flora of Warrandyte* project by the Friends of Warrandyte State Park and Parks Victoria – particularly Pat Coupar, David Van Bockel, Cathy Willis, Josh Revell and historical records of Arthur Williamson;
- Cam Beardsell's thorough assessment of the status of indigenous plant species in Warrandyte State Park, as well as verbal records from his work in the Yarra Valley Parklands and Mullum Mullum Park;
- Information contributed specifically to this study by additional people with first-hand botanical knowledge of Manningham's flora, either as written records, through participating in a workshop that was held on 28th July 2009, or by providing verbal estimates of parameters such as population sizes and amounts of decline of species over periods required under the Red List criteria; and
- Active searching in 2009-2010 to detect the existence, population size and health of some species whose status was uncertain, conducted mainly by Cathy Willis, Pat Coupar and the author.

I wish to particularly thank those who voluntarily contributed information to the project, including Cathy Willis, Cam Beardsell, Pat Coupar, Josh Revell, David Cameron, Lyn Meredith, David Van Bockel, Sharon Mason, Jane Pammer, Alan Noy, Ant Owen, Doug Froid and Matthew Dell.

A small proportion of Manningham's flora was assessed collaboratively in the workshop on 28th July 2009. The remaining species were assessed by the author with consultation when required. Cathy Willis spent several hours answering questions for the assessments of numerous species, as indicated in the companion document, '*Red List Assessments of Plant Species in Manningham*'.

Inevitably, small populations of some species have been overlooked or are yet to be discovered. I would appreciate receiving information about any such omission. It would be unlikely that such an omission would materially change the assessment of a species, unless the whole species has been overlooked.

4.2. Process

A database of records of indigenous plant species in Manningham was compiled from the information sources above. The database allowed extraction of statistics for each species, such as the number of records, in which parts of Manningham they occurred and the date of the most recent record. The companion document, '*Red List Assessments of Plant Species in Manningham*', was compiled by combining database data with textual information about each species, such as reproductive success, reliability of records and information about declining populations and habitat. That document contains a thorough compilation of information about almost all indigenous plant species in Manningham, including an explanation of how the threat ratings in this report were derived from the underlying information.

To gain an initial impression of the spatial distribution and 'area of occupancy' of each species, records were grouped into 1 km × 1 km grid squares from Zone 55 of the Map Grid of

Australia. (The Red List guidelines recommend 2 km × 2 km for global assessments but the smaller size was deemed more appropriate for a municipality.) The number of grid cells in which a species has been recorded provides a measure of the area of occupancy for Red List criterion D2. When the cells occupied by a species fall into distinct clusters, this helps reveal separate subpopulations for assessment of criterion D2.

The dates of the records available for each species provide an initial guide to whether there has been a decline. For example, some sites have been botanically surveyed at intervals over many years, and if those surveys show reducing abundance of a species, or absence of the species during more recent surveys, a decline is implicated. Such observations are considered alongside the known changes in the quality or extent of habitat. For example, the area and condition of wetlands and swampy ground are known to have declined progressively over the past decade, particularly since 2006.

Some of the Red List criteria which take decline into account require quantification of the extent of the decline. Specifically, this applies to criteria A and C1. Quantification of decline requires information about changes in subpopulation sizes over various durations, which often requires inference from undocumented observations of experts and knowledge of associated changes in habitat extent and quality. In many cases, such information is not available. In those cases where it is available, expert judgment is often more important than empirical data.

Expert judgement is also needed for estimation of the length of a generation of many species. For a Red List assessment, a generation of a species is defined as the average age of plants that produce offspring in natural conditions. For a substantial number of species ranging from eucalypts to orchids, a generation is not known precisely but is clearly so long that the duration of three generations used in Red List criteria A and C1 can extend from the time of first settlement to somewhere in the future. In such cases, it is important to take into account that approximately 63% of Manningham now supports no native vegetation, with the loss being greatest in the south and west (Foreman 2004).

The author spent 46 hours gathering the raw data for the assessments (excluding fieldwork, which was done on a voluntary basis) followed by 127 hours assessing 545 species according to the Red List system. These figures represent an average of twenty minutes per species, although some took much longer. Assistance from others is not included in the twenty minutes.

5. Results

5.1. Rare or Threatened Throughout Victoria

Of the species listed by Walsh and Stajsic (2007) as rare or threatened in Victoria or Australia, there are twenty-nine species, one subspecies and one variant that are credibly recorded from Manningham. These are listed in Table 1, along with their conservation status in Manningham. Four of these species are not recorded with full confidence, as noted in the comments in Table 1.

Table 1. Plants of Manningham that are Rare or Threatened State-wide or Nationally.

Entries in the 'Status' column use the following codes:

C Critically endangered K Uncertain V Vulnerable – none of the above
E Endangered R Rare X Extinct

Species are listed in order of security nationally, then in Victoria, then ordered alphabetically by name.

Species Name	Status in Aust / Vic / Mannin-gham	Comments
<i>Dianella amoena</i> (Matted Flax-lily)	E / E / C	8-10 at Candlebark Park (part of Yarra Valley Parklands) and 2 at Clontarf Res, Templestowe.
<i>Amphibromus fluitans</i> (River Swamp Wallaby-grass)	V / V / C	In billabongs of the Yarra River at Bulleen.
<i>Caladenia oenochila</i> (Wine-lipped Spider-orchid)	V / V / C	The only records in twenty years were of two plants in The One Hundred Acres, one in 2008 and another in 2009.
<i>Acacia leprosa</i> (Cinnamon Wattle) - Dandenong Ranges variant	R / R / E	Less than 200 individuals, in Manningham's southeastern quarter.
<i>Caladenia venusta</i> (Large White Spider-orchid)	R / R / X	Last seen in the late 1970s at Harding Rd, Warrandyte.
<i>Callitriche brachycarpa</i> (Short Water Starwort)	R / V / C	Very rare, short-lived species that lives on drying mud following floods of the Yarra River,
<i>Eucalyptus fulgens</i> (Green Scentbark)	R / R / C	Identity unconfirmed.
<i>Eucalyptus yarraensis</i> (Yarra Gum)	R / R / C	An isolated occurrence near O'Briens La, Templestowe Lower.
<i>Levenhookia sonderi</i> (Slender Stylewort)	R / R / V	A very sporadic ephemeral at several locations, sometimes with >1,000 individuals in a small area for one season.
<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra) (Arching Flax-lily)	K / V / C	In ones and twos at several locations around Warrandyte.
<i>Pomaderris vacciniifolia</i> (Round-leaf Pomaderris)	V / V / X	Formerly beside the Yarra River (where it persists on the northern bank in Nillumbik).
<i>Cardamine papillata</i> (Forest Bitter-cress)	- / V / C	A single known colony in Warrandyte State Park, declined to less than 50 plants in 2009.
<i>Geranium solanderi</i> (Austral Cranesbill)	- / V / E	Three small colonies in Warrandyte State Park.
<i>Pterostylis grandiflora</i> (Cobra Greenhood)	- / V / C	A single, small colony in Park Orchards which failed to appear in the last two years.
<i>Austrostipa rudis</i> subsp. <i>australis</i> (Veined Spear-grass)	- / R / E	Less than 250 individuals in several widely separated locations.
<i>Billardiera scandens</i> s.s. (Velvet Apple-berry)	- / R / C	Only a handful of plants, all in Warrandyte.
<i>Caladenia praecox</i> (Early Caladenia)	- / R / C	A few dozen plants, in Warrandyte and Park Orchards.
<i>Cladium procerum</i> (Leafy Twig-rush)	- / R / C	A single colony on an island in the Yarra River.
<i>Corybas fimbriatus</i> (Fringed Helmet-orchid)	- / R / C	A colony of <50 plants in Warrandyte State Park.
<i>Fimbristylis velata</i> (Veiled Fringe-sedge)	- / R / E	Confined to billabongs in Bulleen, where hundreds appear temporarily following floods of the Yarra River.
<i>Pimelea pauciflora</i> (Poison Rice-flower)	- / R / C	Perhaps just a single wild plant, beside the Yarra in Wonga Park.
<i>Senecio campylocarpus</i> (Floodplain Groundsel)	- / R / C	Known from only a small cluster in a billabong in Bulleen, but possibly underreported.

Species Name	Status in Aust / Vic / Mannin-gham	Comments
<i>Bolboschoenus fluviatilis</i> (Stream Club-rush)	- / K / E	Rare in shallow water of the Yarra River in Warrandyte and Wonga Park. A voucher specimen is need for validation.
<i>Caladenia australis</i> (Southern Spider-orchid)	- / K / X	Last seen in the 1970s at Harding Rd, Warrandyte.
<i>Caladenia parva</i> (Small Spider-orchid)	- / K / C	Possibly all records of this species are referable to the more common <i>C. phaeoclavia</i> because the two species are extremely similar.
<i>Caladenia prolata</i> (Fertile Caladenia)	- / K / C	The only record is of two plants at Fourth Hill, Warrandyte, in 1996.
<i>Carex chlorantha</i> (Green-top Sedge)	- / K / C	Three small, wild colonies in serious decline from drying conditions.
<i>Desmodium varians</i> (Slender Tick-trefoil)	- / K / V	Several locations totalling a few hundred plants.
<i>Lepidium pseudohyssopifolium</i> (Pepper-cress)	- / K / C	Extremely small numbers beside a billabong in Bulleen.
<i>Oxalis thompsoniae</i> (Thompson's Wood-sorrel)	- / K / K	A weedy species of pasture, possibly not indigenous.
<i>Prasophyllum pyriforme</i> s.s. (Silurian Leek-orchid)	- / K / X	Wonga Park is the type locality, from where the most recent specimens were taken in the 1930s.

The criteria used by Walsh and Stajsic (2007) to determine threat ratings were quite different from the IUCN Red List criteria, and not nearly as rigorous, transparent or accepted by the scientific community. A near-complete Red List assessment of Victoria's native plant species by David Cameron (Senior Botanist of the Department of Sustainability & Environment) has shown that far more species meet the Red List criteria for threatened species than were categorised as rare or threatened by Walsh and Stajsic (2007).

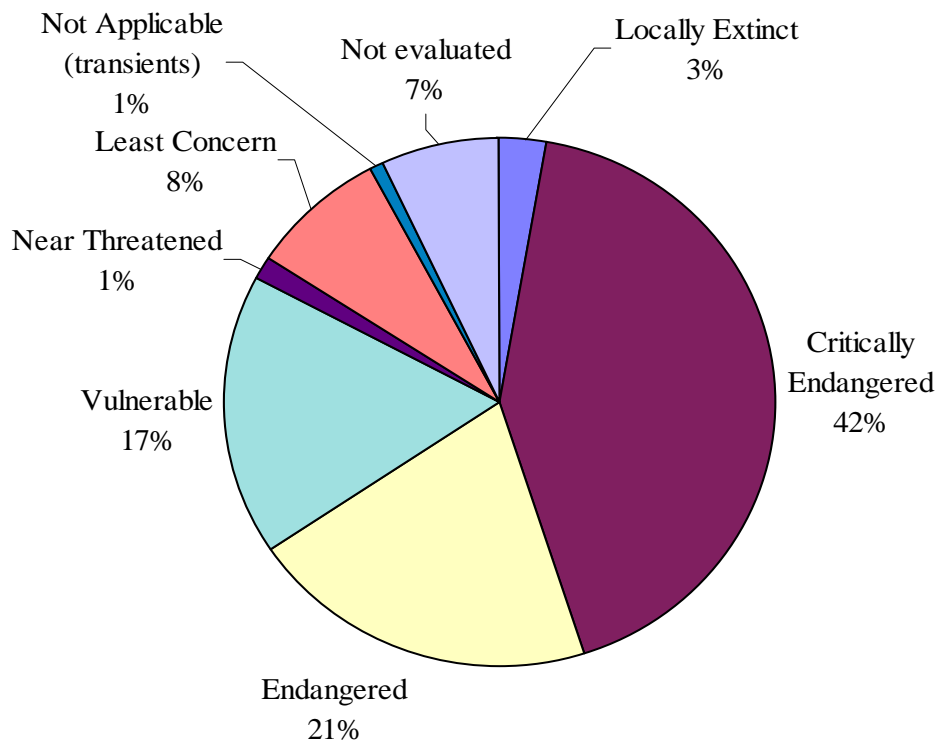
Nine of the thirty-one entries in Table 1 are orchids and three of these orchids can be presumed to be extinct in Manningham. This reflects the nationwide tendency for orchids to lead the extinctions of plant species.

Only two plant species in Table 1 are listed as threatened plants under the *Flora and Fauna Guarantee Act 1988*: *Callitriche brachycarpa* and *Dianella amoena*. Listing under that Act does not reflect the degree of threat faced by those species relative to the others in Table 1.

5.2. Locally Threatened Species

Figure 2 provides a graphical summary of the proportion of species in each category of extinction risk (plus the 7% of species that were not evaluated). The large proportion of plant species that are listed as threatened with extinction in Manningham is striking. 82% of all the assessed species that are not already extinct are Critically Endangered, Endangered or Vulnerable by the Red List criteria. Many of these species are present at very few sites, and many have critically small populations.

Figure 2. Summary of the ratings of risk of local extinction of Manningham’s indigenous plant species. The level of risk reduces clockwise from the ‘Locally Extinct’ category.



Two hundred and forty-six species, or 42% of all indigenous species currently growing in Manningham, meet the criteria for Critically Endangered in the municipality. This is an indication that scores of plant species could die out in Manningham over the next decade, unless preventative measures are taken. This would be an unprecedented collapse in biodiversity.

Conservation of native flora in Manningham is at a critical stage, and this has grave implications for native fauna.

Nevertheless, corrective measures are possible and it is still realistic to aim to maintain the existence of every indigenous plant species presently in the municipality.

5.3. Reasons Why Species are Locally Threatened

Table 2 summarises how many species were found to meet each Red List criterion for the categories of Critically Endangered, Endangered or Vulnerable. It shows that the most commonly met criterion is D, under which a species is classified as Critically Endangered if there are fewer than fifty mature individuals, or Endangered if there are 50-249 mature individuals, or Vulnerable if there are 250-999 individuals. No decline has to be demonstrated for a species to meet category D. The high frequency with which criterion D is met indicates that many species have extremely small populations in Manningham, including 176 species with fewer than fifty individuals. In fact, many of those 176 species have at most a few individuals, or have not been seen for some years. Such species are very likely to be at serious risk of unsuccessful reproduction due to pollination failure and inbreeding. Propagating and planting additional members of those species is sometimes an option for reducing the

extinction risk, as has been tried with varying levels of success by the Friends of Warrandyte State Park and park rangers.

Table 2. Numbers of species that meet each Red List criterion for each threatened category.

Note that many species meet multiple criteria.

Red List Criterion		Number of Species		
Label	Description	Critically Endangered	Endangered	Vulnerable
A	Extent of decline over 3 generations or 10 years (regardless of population size)	15	16	18
C1	Small population in quantifiable decline	16	18	40
C2(a i)	Small, declining population with tiny subpopulations	108	31	15
C2(a ii)	Small, declining, highly localised population	14	1	1
C2b	Small, declining population with extreme fluctuations	24	8	4
D	Very small or restricted population	175	65	42

Table 2 shows that criterion C2(ai) is the second most frequently met criterion. These species are in decline (to any degree) and must meet the following specific conditions:

- Critically Endangered species have fewer than 250 mature individuals throughout Manningham and less than 50 in each subpopulation. (Subpopulations are essentially independent of each other.);
- Endangered species have fewer than 2,500 mature individuals throughout Manningham and less than 250 in each subpopulation; and
- Vulnerable species have fewer than 10,000 mature individuals throughout Manningham and less than 1,000 in each subpopulation.

Any species that meets criterion D and is known to be in decline automatically meets criterion C2(ai), often at a higher threat category. Given the abundance of species meeting criterion D, it is perhaps not surprising that so many meet criterion C2(a i).

The high numbers for criterion C2(a i) in Table 2 emphasise the same problem that was revealed by the abundance of species meeting criterion D, i.e. that many species are in such small numbers that they face reproductive failure and are hence likely to be in decline. Criterion C2(a i) has the distinguishing feature that it takes into account the extra risk faced by a species when its population is broken up into small, reproductively isolated subpopulations. The data reflect that this is a serious problem in Manningham, which is because of the high level of fragmentation of habitat that has occurred as a result of agriculture and urbanisation.

Fragmentation of habitat and reduction of already-small plant populations is being continually exacerbated by urban development in bushland areas. These problems can be reduced by amending the Manningham Planning Scheme, as discussed in Section 6.1

A way of compensating for the fragmentation of species into small subpopulations is to exchange seeds, pollen or propagated individuals between subpopulations. Council could do this for affected species in Council reserves.

By far the most common cause (or apparent cause) of species being in decline is the drying out of soil and wetlands over the past decade, and particularly since 2005. Criteria C1 and C2 only apply when a species is in *continuing* decline, not just affected by a fluctuation that will end. It is therefore important to consider whether the dry conditions of the past thirteen years are simply a temporary phase due to cyclic drought.

There is now convincing evidence that human-induced climate change has played a major role in the dryness and high temperatures of southeastern Australia (including Manningham) in recent years (e.g. Timbal 2009). Research by the CSIRO and the Bureau of Meteorology indicates that the climate of Victoria will continue a trend toward substantially drier conditions, particularly in spring and (to a lesser degree) winter*. Winter rain is extremely important for seed germination and dry conditions in spring can cause mass deaths of seedlings. We should therefore expect ongoing declines of many plant species and exacerbation of existing reproductive problems.

The plants most threatened by drying conditions are those of wetlands and wet soil. Lorimer (2007a) demonstrated that such plants have suffered worse than others over the past decade in the municipality of Knox on Melbourne's eastern and southeastern fringe.

Provision of water is a feasible way of rescuing some species threatened by drying conditions. Melbourne Water regulates the flow of the Yarra River and has the ability to permit more environmental flows, which help aquatic fauna as well as wetland plants on the Yarra floodplains. Engineering works could also divert water more often into wetlands beside many of Manningham's streams, e.g. with channels to direct floodwater into wetlands or pipes to divert base flows to wetlands that become dangerously dry. Manual watering of highly threatened wild plants could also be done in the same way that vehicle-mounted tanks are presently used to keep ornamental trees alive along streets and in parks.

6. Recommendations

The suggestions above for how to reduce the risk of local plant extinctions are just some of many that could be undertaken. The most appropriate measures vary from species to species and can be partly determined from the threat criteria applicable to each species (tabulated in Appendix A) and the discussion of each species provided in the companion document, '*Red List Assessments of Plant Species in Manningham*'.

To provide detailed recommendations would be beyond the scope of this project, which has already taken more than twice as much work as it has been funded for. Instead, it is recommended that a Locally Threatened Species Management Plan be prepared to determine strategies and specific actions that Council and others can take in response to the unprecedented declines that are affecting Manningham's flora.

However, this report would be seriously deficient if it were not to elaborate on one of the quickest and most powerful responses that Council can make, which is to provide protection for locally threatened plants in the Manningham Planning Scheme.

* See the predictive maps at <http://www.climatechangeinaustralia.gov.au/vicrain1.php>.

6.1. Planning Scheme Protection

As described earlier, removal of native vegetation continues to be a major cause of decline of locally threatened plants through:

- Direct destruction of plants;
- Loss and fragmentation of habitat; and
- Increasing problems of pollination failure and inbreeding as population sizes fall from the above causes.

The decline of some locally threatened species also causes large consequences for wildlife, as in the case of the declines of Mistletoebirds and Imperial White Butterflies as a result of the collapse of mistletoe numbers.

There is currently no recognition of locally threatened plants in the Manningham Planning Scheme, so regulation of vegetation removal pays no regard to locally threatened species.

It is therefore recommended that the threat ratings of plant species in Manningham should be taken into consideration when Council is assessing proposals for works or land development that may adversely affect native vegetation. Preference should be given for project designs, methods or locations that avoid (or at worst, minimise) the loss of locally threatened plants. When harm to a locally threatened species cannot be avoided, compensating measures should be encouraged or required, e.g. by propagation, planting or rabbit control to improve the security of retained locally threatened plants.

In some cases, it is likely to be appropriate that the removal of one locally threatened species be compensated by improvements to the security of an equally (or more) threatened species. For example, a tree with a mistletoe should be retained as a high priority, but if it must be removed, it is unlikely to be possible to do anything to make mistletoes more secure.

Superficially, it may seem that the highest emphasis should go on species rated as Critically Endangered, then Endangered and finally, Vulnerable. However, there are many exceptions to this. The threat categories reflect the rarity or extent of decline of each species over various durations, which does not always reflect the importance of protecting them under the planning scheme.

Take the example of the eucalypt, Yellow Box (*Eucalyptus melliodora*). Its natural life span is over a century, so the time from first settlement to the current day is less than three of their generations. Red List criterion A2 then puts the species into the Endangered category on the basis of its historical decline relative to the species' population at the time of settlement. Despite the Endangered rating, Yellow Box does not warrant species-specific protection under the planning scheme because:

- It remains sufficiently abundant and widespread that no single planning permit application would significantly affect its risk of local extinction; and
- The Endangered rating relates to clearing that mostly occurred decades ago and has greatly abated since, so that Yellow Box trees today are maintaining their number and health fairly well.

In general, widespread and very long-lived species that are classified as locally threatened solely on the basis of their decline due to agriculture and urbanisation since the 19th century

are less important to recognise in the planning scheme than their threat ratings might initially suggest.

Some other types of species whose priority for planning scheme protection is not what their threat ratings might suggest include:

- Species that play very important ecological functions ('keystone species'), so that the importance of retaining them is greater than for many species that are more at risk of local extinction;
- Species whose occurrence at any particular location is transient and whose removal would not materially affect the survival of the species. These species are short-lived, have highly mobile seeds and appear unpredictably, often on ground that has been laid bare;
- Species whose plants are extremely long-lived and persistent but with very little capacity to produce new plants (e.g. *Xanthorrhoea minor*), putting them into slow, incremental decline as plants are destroyed by vegetation removal;
- Other species that are unusually susceptible to vegetation removal.

A statutory planner cannot be expected to take such considerations into account. Therefore, the author has done so for all 584 species believed to be indigenous to Manningham (as listed in Appendix A) and made a professional judgement about which of them should be given specific protection when Council considers planning permit applications. These are indicated in Appendix A. They amount to a substantial fraction of the total number of indigenous species in Manningham, but they are the rarer species and will not be affected by most planning permit applications.

It is recommended that for any planning permit application involving non-trivial removal of native vegetation, Council determine whether it affects any species listed as being suitable for protection under the planning scheme, and if so:

- See whether harm to those species can be avoided or reduced;
- Apply permit conditions that provide appropriate compensation for harm to those species (with maximum emphasis on species with names in bold in Appendix A and those listed as Critically Endangered or Endangered); and
- Record the details of the threatened species that are approved to be removed, and the compensatory measures, in a register of such information.

The register will facilitate future reassessments of the decline of locally threatened species and allow checking the medium- and long-term success of the compensatory measures.

6.2. Additional Species or Subspecies

There are almost certainly some indigenous plant species in Manningham that have not yet been discovered. To have escaped detection, they must be very scarce, very localised or both. It should be a *prima facie* assumption that any wild, indigenous species discovered in Manningham in future is Critically Endangered.

Some species that are presently known to be in Manningham will almost certainly be segregated by taxonomists into two or more species or subspecies in future. Often, only one of the newly defined segregates will occur in Manningham, in which case there will be no change to the threat category listed in Appendix A. If more than one of the segregates occurs

in Manningham, the threat level facing each of them must be at least as high as the category that has been assigned for the composite.

Bibliography

- Foreman P. (2004) *'Manningham BioSites – Manningham City Council Sites of (Biological) Significance Review'*. Manningham City Council, Doncaster, Victoria. 196 pp. + 64 maps.
- International Union for the Conservation of Nature (2001). *'IUCN Red List Categories and Criteria: Version 3.1'*. IUCN Species Survival Commission : Gland, Switzerland and Cambridge. ii + 30 pp.
- International Union for the Conservation of Nature (2003). *'Guidelines for Application of IUCN Red List Criteria at Regional Levels: Version 3.0'*. IUCN Species Survival Commission : Gland, Switzerland and Cambridge. ii + 26 pp.
- International Union for the Conservation of Nature (2008). *'Guidelines for Using the IUCN Red List Categories and Criteria: Version 7.0'*. IUCN Standards and Petitions Working Group : Gland, Switzerland and Cambridge. ii + 68 pp.
- Lorimer G.S. (2006). *'Inventory and Assessment of Indigenous Flora and Fauna in Boroondara'*, 1st edition. City of Boroondara, Camberwell, Victoria. 480 pp.
- Lorimer G.S. (2007). *'Monitoring of Bushland Reserves in Knox – 2007 Review'*, for Knox City Council. 133 pp.
- Lorimer G.S. (2010). *'Sites of Biological Significance in Knox'*, 2nd edition. Knox City Council, Wantirna South, Victoria. 2 volumes, xvii+668 pp.
- Timbal B. (2009). The continuing decline in South-East Australian rainfall: update to May 2009. CAWCR (Centre for Australian Weather and Climate Research) Research Letters 2:4-46.
- Walsh N.G. and Stajsic V. (2007). *'A Census of the Vascular Plants of Victoria'*, 8th Edn. National Herbarium of Victoria : South Yarra.

Appendix A. Threat Classifications of Manningham Plants

The following table lists all species that are credibly reported to be indigenous to Manningham. They are ordered alphabetically by scientific name. Bold type indicates species listed by Walsh and Stajsis (2007) as rare or threatened in Victoria or more widely (Section 8). The first column indicates which species are recommended to be given specific protection under the Manningham Planning Scheme in accordance with Section 6.1. The second column provides each species' code number from the Department of Sustainability & Environment's 'Flora Information System'. The 'Threat Category' column contains the ratings of local extinction risk according to the Red List criteria, using the international standard codes:

RE	Extinct in Manningham	NT	Near Threatened
CR	Critically Endangered	LC	Least Concern
EN	Endangered	NA	Not Applicable
VU	Vulnerable		

The final column indicates the criteria that each species meets to achieve the stated threat category. The codes are summarised in Appendix B (page 29).

Planning Protection?	Code no.	Scientific Name	Common Name	Threat Category	Red List Criteria
✓	7	<i>Acacia acinacea</i>	Gold-dust Wattle	VU	C1
✓	8	<i>Acacia aculeatissima</i>	Thin-leaf Wattle	VU	C1
✓	18	<i>Acacia brownii</i>	Heath Wattle	CR	C2(ai), D
	25	<i>Acacia dealbata</i>	Silver Wattle		
	38	<i>Acacia genistifolia</i>	Spreading Wattle	LC	
✓	41	<i>Acacia gunnii</i>	Ploughshare Wattle	CR	D
	45	<i>Acacia implexa</i>	Lightwood	CR	A2abc
✓	48	<i>Acacia lanigera</i>	Woolly Wattle	CR	C2(ai), D
✓	5140	<i>Acacia leprosa</i> (Dandenong Range variant)		EN	D
		Dandenong Range Cinnamon Wattle			
	56	<i>Acacia mearnsii</i>	Black Wattle		
	57	<i>Acacia melanoxylon</i>	Blackwood	CR	A2abc
✓	62	<i>Acacia mucronata</i>	Narrow-leaf Wattle	CR	C2(ai), D
✓	63	<i>Acacia myrtifolia</i>	Myrtle Wattle	CR	C2(b)
	71	<i>Acacia oxycedrus</i>	Spike Wattle	NA	vagrant
	72	<i>Acacia paradoxa</i>	Hedge Wattle	LC	
	78	<i>Acacia pycnantha</i>	Golden Wattle		
	91	<i>Acacia stricta</i>	Hop Wattle	CR	D
✓	98	<i>Acacia ulicifolia</i>	Juniper Wattle	CR	D
✓	99	<i>Acacia verniciflua</i>	Varnish Wattle	CR	D
	100	<i>Acacia verticillata</i>	Prickly Moses		
	104	<i>Acaena agnipila</i>	Hairy Sheep's Burr		
	106	<i>Acaena echinata</i>	Sheep's Burr		
	105	<i>Acaena novae-zelandiae</i>	Bidgee-widgee	LC	
	107	<i>Acaena ovina</i>	Australian Sheep's Burr		
✓	110	<i>Acianthus caudatus</i>	Mayfly Orchid	CR	C1, C2(ai), D
✓	4439	<i>Acianthus pusillus</i>	Small Mosquito Orchid	EN	D
	123	<i>Acrotriche serrulata</i>	Honey-pots	VU	C1
	129	<i>Adiantum aethiopicum</i>	Common Maidenhair	VU	A2ace
✓	168	<i>Ajuga australis</i>	Austral Bugle	EN	D
	174	<i>Alisma plantago-aquatica</i>	Water Plantain	EN	C1
✓	677	<i>Allocasuarina littoralis</i>	Black Sheoak	EN	A2ac, D
	5097	<i>Alternanthera denticulata</i>	Lesser Joyweed	VU	C1, C2(b)
✓	3623	<i>Amphibromus fluitans</i>	River Swamp Wallaby-grass	CR	C2(b), D
✓	3628	<i>Amphibromus nervosus</i>	Veined Swamp Wallaby-grass	CR	C2(ai)
✓	218	<i>Amyema miquelii</i>	Box Mistletoe	EN	C1
✓	220	<i>Amyema pendula</i>	Drooping Mistletoe	EN	A2abc, C1
✓	222	<i>Amyema quandang</i>	Grey Mistletoe	CR	C1

Planning Protection?	Code no.	Scientific Name	Common Name	Threat Category	Red List Criteria
✓	232	<i>Anogramma leptophylla</i>	Annual Fern	CR	C2(aii)
✓	240	<i>Aphanes australiana</i>	Australian Piert	CR	C2(ai), C2(b)
✓	242	<i>Aphelia gracilis</i>	Slender Aphelia	CR	C2(ai), C2(b)
✓	243	<i>Aphelia pumilio</i>	Dwarf Aphelia	CR	C2(ai), C2(b)
✓	269	<i>Arthropodium milleflorum</i>	Pale Vanilla-lily	EN	D
✓	270	<i>Arthropodium minus</i>	Small Vanilla-lily	CR	C2(ai), D
	5126	<i>Arthropodium strictum</i>	Chocolate Lily	LC	
✓	278	<i>Asperula conferta</i> ¹	Common Woodruff	CR	C2(ai)
✓	287	<i>Asplenium bulbiferum</i>	Mother Spleenwort	CR	D
✓	288	<i>Asplenium flabellifolium</i>	Necklace Fern	EN	D
	304	<i>Astroloma humifusum</i>	Cranberry Heath		
	332	<i>Atriplex semibaccata</i>	Berry Saltbush	NA	Out of nat. range
✓	909	<i>Austrocynoglossum latifolium</i>	Forest Hound's-tongue	CR	D
		<i>Austrodanthonia</i> – see <i>Rytidosperma</i>			
✓	1360	<i>Austrofestuca hookeriana</i>	Hooker Fescue	CR	C1
✓	3266	<i>Austrostipa bigeniculata</i>	Kneed Spear-grass	EN	D
✓	3270	<i>Austrostipa curticomma</i>	a spear-grass	CR	D
✓	3271	<i>Austrostipa densiflora</i>	Dense Spear-grass	EN	D
✓	3279	<i>Austrostipa mollis</i>	a spear-grass	CR	D
✓	3285	<i>Austrostipa nodosa</i>	Knotty Spear-grass	CR	D
	3288	<i>Austrostipa pubinodis</i>	Tall Spear-grass		
✓	4940	<i>Austrostipa rudis</i> subsp. <i>australis</i>	Veined Spear-grass	EN	D
	4941	<i>Austrostipa rudis</i> subsp. <i>nervosa</i>	Veined Spear-grass	VU	D1
	4942	<i>Austrostipa rudis</i> subsp. <i>rudis</i>	Veined Spear-grass	LC	
	3275	<i>Austrostipa scabra</i> subsp. <i>falcata</i>	Rough Spear-grass	VU	D1, D2
✓	3291	<i>Austrostipa semibarbata</i>	Fibrous Spear-grass	CR	D
	347	<i>Azolla filiculoides</i>	Pacific Azolla	VU	A2, C1, C2(ai), C2(b)
	348	<i>Azolla pinnata</i>	Ferny Azolla	CR	A2, C2(ai), C2(b)
✓	363	<i>Banksia marginata</i>	Silver Banksia	CR	C1, C2(ai), C2(aii), D
✓	382	<i>Bedfordia arborescens</i>	Blanket-leaf	CR	C1, C2(ai), D
	4291	<i>Billardiera mutabilis</i>	Common Apple-berry	LC	
✓	4290	<i>Billardiera scandens</i> s.s. ²	Velvet Apple-berry	CR	D
✓	404	<i>Blechnum cartilagineum</i>	Gristle Fern	CR	D
✓	407	<i>Blechnum minus</i>	Soft Water-fern	CR	C2(ai), D
✓	408	<i>Blechnum nudum</i>	Fishbone Water-fern	CR	C2(ai), D
✓	4669	<i>Bolboschoenus fluviatilis</i> ³	Stream Club-rush	EN	D
✓	417	<i>Bolboschoenus medianus</i>	Marsh Club-rush	CR	D
	440	<i>Bossiaea prostrata</i>	Creeping Bossiaea		
	444	<i>Bothriochloa macra</i>	Red-leg Grass	NA	Out of nat. range
✓	455	<i>Brachyscome decipiens</i>	Field Daisy	CR	C2(ai), C2(aii), D
✓	456	<i>Brachyscome diversifolia</i>	Tall Daisy	CR	C2(ai), D
✓	470	<i>Brachyscome perpusilla</i>	Rayless Daisy	EN	D
	508	<i>Brunonia australis</i>	Blue Pincushion		
	510	<i>Bulbine bulbosa</i>	Yellow Bulbine-lily		
✓	511	<i>Bulbine semibarbata</i>	Leek Lily	VU	D1, D2
	512	<i>Burchardia umbellata</i>	Milkmaids		
	515	<i>Bursaria spinosa</i> subsp. <i>spinosa</i>	Sweet Bursaria		
✓	519	<i>Caesia calliantha</i>	Blue Grass-lily	CR	D
✓	518	<i>Caesia parviflora</i>	Pale Grass-lily	EN	D
✓	743	<i>Caladenia australis</i>	Southern Spider-orchid	RE	
✓	3680	<i>Caladenia carnea</i>	Pink Fingers	EN	C2(ai)

¹ Records of *Asperula scoparia* in Manningham appear to be all referable to *Asperula conferta*.

² Walsh & Stajsis (2007) has faulty entries for the *Billardiera scandens* group. Dr Walsh advises that *B. scandens* should have been listed as 'Rare in Victoria' and *B. mutabilis* should not have been given a rating at all.

³ If there were a specimen verified at the National Herbarium, it would allay misgivings that records of this species in Manningham are actually referable to the more common *Bolboschoenus medianus*.

Planning Protection?	Code no.	Scientific Name	Common Name	Threat Category	Red List Criteria
✓	4900	<i>Caladenia catenata</i>	White Caladenia	CR	D
✓	528	<i>Caladenia clavigera</i>	Plain-lip Spider-orchid	RE	
✓	529	<i>Caladenia congesta</i>	Black-tongue Caladenia	RE	
✓	535	<i>Caladenia gracilis</i>	Musky Caladenia	CR	C2(ai), D
✓	3694	<i>Caladenia oenochila</i>	Wine-lipped Spider-orchid	CR	C2(ai), D
✓	4476	<i>Caladenia parva</i> ⁴	Small Spider-orchid	CR	C2(ai)
✓	4344	<i>Caladenia phaeoclavia</i>	Brown-clubbed Spider-orchid	CR	C2(ai), D
✓	543	<i>Caladenia praecox</i>	Early Caladenia	CR	C2(ai), D
✓	4448	<i>Caladenia prolata</i>	Fertile Caladenia	CR	D
✓	545	<i>Caladenia pusilla</i>	Tiny Caladenia	CR	C2(ai)
✓	3677	<i>Caladenia tentaculata</i>	Large Green-comb Spider-orchid	CR	D
✓	5422	<i>Caladenia transitoria</i>	Eastern Bronze Caladenia	VU	D2
✓	533	<i>Caladenia venusta</i>	Large White Spider-orchid	RE	
✓	551	<i>Calandrinia calyprata</i>	Pink Purslane	EN	D
✓	557	<i>Caleana major</i>	Large Duck-orchid	RE	
✓	565	<i>Callistemon sieberi</i>	River Bottlebrush	EN	D
✓	568	<i>Callitriche brachycarpa</i>	Short Water Starwort	CR	C2(b)
✓	571	<i>Callitriche muelleri</i>	Round Water Starwort	CR	C2(b)
✓	573	<i>Callitriche sonderi</i>	Matted Water Starwort	CR	C2(b)
✓	587	<i>Calochilus paludosus</i>	Red Beard-orchid	CR	C2(ai), D
✓	589	<i>Calochilus robertsonii</i>	Purplish Beard-orchid	CR	C2(ai), D
✓	887	<i>Calochlaena dubia</i>	Common Ground-fern	CR	C2(ai), D
✓	599	<i>Calotis scabiosifolia</i>	Rough Burr-daisy	CR	A2, C1, C2(ai), C2(aii), D
✓	603	<i>Calystegia marginata</i>	Forest Bindweed	CR	C2(ai), C2(b), D
✓	604	<i>Calystegia sepium</i> subsp. <i>roseata</i>	Large Bindweed	EN	C2(ai), D
✓	5034	<i>Cardamine papillata</i>	Forest Bitter-cress	CR	C2(ai), C2(aii), D
	623	<i>Carex appressa</i>	Tall Sedge	EN	C2(ai)
	627	<i>Carex breviculmis</i>	Short-stem Sedge	VU	C1
✓	628	<i>Carex brownii</i>	Sedge	CR	C2(aii)
✓	632	<i>Carex chlorantha</i>	Green-top Sedge	CR	C1
✓	638	<i>Carex fascicularis</i>	Tassel Sedge	CR	C2(ai)
✓	639	<i>Carex gaudichaudiana</i>	Fen Sedge	CR	C2(ai)
	642	<i>Carex inversa</i> ⁵	Knob Sedge		
✓	643	<i>Carex iynx</i>	Sedge	EN	C2(ai)
✓	647	<i>Carex polyantha</i>	Sedge	EN	C2(a), D
	666	<i>Cassinia aculeata</i>	Common Cassinia	VU	C1
	667	<i>Cassinia arcuata</i>	Drooping Cassinia	VU	C2(ai)
	668	<i>Cassinia longifolia</i>	Shiny Cassinia	LC	
✓	671	<i>Cassytha glabella</i>	Slender Dodder-laurel	EN	D
✓	672	<i>Cassytha melantha</i>	Coarse Dodder-laurel	EN	D
	674	<i>Cassytha pubescens</i>	Downy Dodder-laurel	VU	D1
✓	706	<i>Centella cordifolia</i>	Centella	EN	C2(ai)
✓	707	<i>Centipeda cunninghamii</i>	Common Sneezeweed	CR	C2(ai)
✓	5614	<i>Centipeda elatinoides</i>	Elatine Sneezeweed	CR	C2(ai), C2(b)
✓	711	<i>Centrolepis aristata</i>	Pointed Centrolepis	EN	C2(ai), C2(b)
✓	713	<i>Centrolepis fascicularis</i>	Tufted Centrolepis	CR	D
✓	716	<i>Centrolepis strigosa</i>	Hairy Centrolepis	EN	C2(ai), C2(b)
✓	726	<i>Chamaescilla corymbosa</i>	Blue Stars	EN	D
	730	<i>Cheilanthes austrotenuifolia</i>	Green Rock Fern	NT	D1
✓	731	<i>Cheilanthes distans</i>	Bristly Cloak-fern	EN	D
✓	733	<i>Cheilanthes sieberi</i>	Narrow Rock Fern	EN	D
	748	<i>Chenopodium pumilio</i>	Clammy Goosefoot		
✓	753	<i>Chiloglottis reflexa</i>	Autumn Bird-orchid	VU	D1

⁴ *Caladenia parva* and *Caladenia phaeoclavia* are almost indistinguishable and it is likely that, in reality, only one genuine species in Manningham has given rise to the records of both species.

⁵ *Carex inversa* occurs more in lawns and gardens than in natural vegetation. Some of them are likely to be of non-indigenous stock.

Planning Protection?	Code no.	Scientific Name	Common Name	Threat Category	Red List Criteria
✓	754	<i>Chiloglottis trapeziformis</i>	Dainty Bird-orchid	CR	C2(ai), D
✓	4888	<i>Chiloglottis valida</i>	Common Bird-orchid	VU	D1
✓	1606	<i>Chrysocephalum apiculatum</i>	Common Everlasting	CR	D
✓	1628	<i>Chrysocephalum semipapposum</i>	Clustered Everlasting	CR	D
✓	786	<i>Cladium procerum</i>	Leafy Twig-rush	CR	D
	788	<i>Clematis aristata</i>	Mountain Clematis		
	7387	<i>Clematis decipiens</i> <i>Clematis microphylla</i> – see <i>C. decipiens</i>	a small-leafed clematis	LC	
	801	<i>Comesperma volubile</i>	Love Creeper	VU	C1
✓	5884	<i>Convolvulus angustissimus</i>	Blushing Bindweed	CR	C2(ai), D
	822	<i>Coprosma quadrifida</i>	Prickly Currant-bush	VU	C1
✓	830	<i>Correa glabra</i>	Rock Correa	EN	D
✓	4370	<i>Correa reflexa</i> var. <i>reflexa</i>	Common Correa	EN	C1
✓	2705	<i>Corunastylis despectans</i>	Sharp Midge-orchid	CR	D
✓	838	<i>Corybas diemenicus</i> s.l.	Veined Helmet-orchid	EN	D
✓	839	<i>Corybas fimbriatus</i>	Fringed Helmet-orchid	CR	D
✓	837	<i>Corybas incurvus</i>	Slaty Helmet-orchid	CR	C2(aii)
	846	<i>Cotula australis</i>	Common Cotula	LC	
✓	4650	<i>Craspedia variabilis</i>	Variable Billy-buttons	CR	C1, C2(ai), D
✓	864	<i>Crassula closiana</i>	Stalked Crassula	EN	C2(b)
	860	<i>Crassula decumbens</i>	Spreading Crassula	LC	
	862	<i>Crassula helmsii</i>	Swamp Crassula	VU	C1
✓	865	<i>Crassula peduncularis</i>	Purple Crassula	CR	C2(b)
	866	<i>Crassula sieberiana/tetramera</i>	Sieber Crassula	LC	
✓	883	<i>Cryptostylis leptochila</i>	Small Tongue-orchid	CR	D
✓	884	<i>Cryptostylis subulata</i>	Large Tongue-orchid	RE	
✓	524	<i>Cyanicula caerulea</i>	Blue Caladenia	CR	C2(ai), D
✓	895	<i>Cyathea australis</i>	Rough Tree-fern	CR	C2(ai)
	903	<i>Cymbonotus preissianus</i>	Austral Bear's-ears	VU	D1
✓	908	<i>Cynoglossum australe</i>	Australian Hound's-tongue	CR	D
✓	910	<i>Cynoglossum suaveolens</i>	Sweet Hound's-tongue	CR	C2(ai), D
✓	922	<i>Cyperus gunnii</i>	Flecked Flat-sedge	CR	D
✓	926	<i>Cyperus lucidus</i>	Leafy Flat-sedge	CR	C2(ai), D
✓	112	<i>Cyrtostylis reniformis</i>	Small Gnat Orchid	CR	D
	989	<i>Daucus glochidiatus</i>	Austral Carrot	EN	C2(ai), C2(b)
✓	996	<i>Daviesia latifolia</i>	Hop Bitter-pea	CR	D
	1000	<i>Daviesia leptophylla</i>	Narrow-leaf Bitter-pea	VU	C1
✓	2415	<i>Derwentia derwentiana</i>	Derwent Speedwell	CR	C1, C2(ai), D
	1008	<i>Desmodium gunnii</i>	Southern Tick-trefoil		
✓	4425	<i>Desmodium varians</i>	Slender Tick-trefoil	VU	D1
✓	1020	<i>Deyeuxia minor</i>	Small Bent-grass	CR	D
	1023	<i>Deyeuxia quadriseta</i>	Reed Bent-grass	VU	C1
	5555	<i>Dianella admixta</i>	Black-anther Flax-lily	LC	
✓	5084	<i>Dianella amoena</i>	Matted Flax-lily	CR	D
	5559	<i>Dianella laevis</i>	Smooth Flax-lily		
✓	5560	<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	Arching Flax-lily	CR	D
✓	1030	<i>Dianella tasmanica</i>	Tasman Flax-lily	CR	D
	1033	<i>Dichelachne crinita</i>	Long-hair Plume-grass	VU	D1
✓	4528	<i>Dichelachne hirtella</i>	Hairy Plume-grass	EN	D
	3792	<i>Dichelachne rara</i>	Common Plume-grass	VU	C1
	3791	<i>Dichelachne sieberiana</i>	Plume-grass	EN	C2(ai)
	1036	<i>Dichondra repens</i>	Kidney-weed	LC	
✓	1039	<i>Dicksonia antarctica</i>	Soft Tree-fern	CR	C2(ai), D
	5931	<i>Dillwynia cinerascens</i>	Grey Parrot-pea		
✓	1057	<i>Dillwynia phyllicoides</i>	Small-leaf Parrot-pea	EN	D
✓	4889	<i>Dipodium roseum</i>	Rosy Hyacinth-orchid	EN	D
✓	5423	<i>Diuris chryseopsis</i>	Golden Moths	CR	C1, C2(ai), D
✓	1079	<i>Diuris orientis</i>	Wallflower Orchid	CR	C2(ai), D

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✓	1080	<i>Diuris pardina</i>	Leopard Orchid	EN	C2(ai)
✓	1085	<i>Diuris sulphurea</i>	Tiger Orchid	EN	D
✓	1098	<i>Doodia australis</i>	Common Rasp-fern	EN	D
✓	1097	<i>Doodia caudata</i>	Small Rasp-fern	CR	C2(ai)
✓	1103	<i>Drosera binata</i>	Forked Sundew	RE	
✓	1106	<i>Drosera macrantha</i>	Sundew	CR	D
	1102	<i>Drosera peltata</i> subsp. <i>auriculata</i>	Tall Sundew	EN	A2
	1107	<i>Drosera peltata</i> subsp. <i>peltata</i>	Pale Sundew	LC	
	1110	<i>Drosera whittakeri</i>	Scented Sundew	LC	
	1122	<i>Echinopogon ovatus</i>	Common Hedgehog-grass	NT	A2, C2(ai)
✓	1132	<i>Einadia hastata</i>	Saloop Saltbush	EN	D
	1133	<i>Einadia nutans</i>	Nodding Saltbush	VU	D1
✓	1134	<i>Einadia trigonos</i>	Hill Saltbush	VU	D2
✓	1138	<i>Elatine gratioloides</i>	Waterwort	EN	C2(b)
✓	1139	<i>Eleocharis acuta</i>	Common Spike-rush	EN	C1
✓	1146	<i>Eleocharis sphacelata</i>	Tall Spike-rush	EN	C1
	146	<i>Elymus scaber</i>	Common Wheat-grass	VU	C1
	4478	<i>Epacris impressa</i>	Common Heath	VU	C1, C2(ai)
✓	4444	<i>Epilobium billardierianum</i> subsp. <i>billardierianum</i>	Variable Willow-herb	CR	C2(ai), D
	4445	<i>Epilobium billardierianum</i> subsp. <i>cinereum</i>	Variable Willow-herb	CR	C2(ai), C2(b)
	1179	<i>Epilobium hirtigerum</i>	Hairy Willow-herb	VU	C1
	1185	<i>Eragrostis brownii</i>	Common Love-grass	VU	C1
✓	1219	<i>Eriochilus cucullatus</i>	Parson's Bands	CR	C2(ai), D
✓	1240	<i>Eryngium vesiculosum</i>	Prickfoot	CR	C2(ai), D
✓	1252	<i>Eucalyptus blakelyi</i>	Hill Red Gum	CR	D
✓	1258	<i>Eucalyptus camaldulensis</i>	River Red Gum	CR	A2c
✓	3733	<i>Eucalyptus cephalocarpa</i>	Mealy Stringybark	CR	A2c (C1)
✓	1272	<i>Eucalyptus dives</i>	Broad-leafed Peppermint	CR	D
✓	5175	<i>Eucalyptus fulgens</i>⁶	Green Scentbark	CR	D
	3732	<i>Eucalyptus goniocalyx</i>	Bundy, Long-leaf Box	EN	A2ce
✓	1294	<i>Eucalyptus macrorhyncha</i>	Red Stringybark	CR	A2ace
	1297	<i>Eucalyptus melliodora</i>	Yellow Box	EN	A2c
✓	1303	<i>Eucalyptus nortonii</i>	Silver Bundy	CR	D
✓	1304	<i>Eucalyptus obliqua</i>	Messmate Stringybark	CR	A2ace
	1307	<i>Eucalyptus ovata</i>	Swamp Gum	CR	A2ace
	4335	<i>Eucalyptus polyanthemos</i>	Red Box	LC	
	3828	<i>Eucalyptus radiata</i>	Narrow-leaf Peppermint	EN	A2ace
✓	1315	<i>Eucalyptus rubida</i>	Candlebark	CR	A2ace
✓	7656	<i>Eucalyptus tricarpa</i> subsp. <i>tricarpa</i>	Red Ironbark	CR	D
	4463	<i>Eucalyptus viminalis</i> subsp. <i>viminalis</i>	Manna Gum	VU	A2ac
✓	1326	<i>Eucalyptus yarraensis</i>	Yarra Gum	CR	D
	1466	<i>Euchiton collinus</i>	Creeping Cudweed	LC	
	1465	<i>Euchiton involucratus</i>	Common Cudweed	EN	C2(ai)
	1471	<i>Euchiton sphaericus</i>	Star Cudweed	EN	D
	1350	<i>Exocarpos cupressiformis</i>	Cherry Ballart	VU	A2c
✓	1353	<i>Exocarpos strictus</i>	Pale-fruit Ballart	CR	D
✓	1369	<i>Fimbristylis velata</i>	Veiled Fringe-sedge	EN	C1, C2(aii), C2(b)
	1394	<i>Gahnia radula</i>	Thatch Saw-sedge	EN	A2c
	1409	<i>Galium gaudichaudii</i>	Rough Bedstraw	LC	
	1413	<i>Galium propinquum</i>	Maori Bedstraw		
✓	4459	<i>Gastrodia sesamoides</i>	Cinnamon Bells	CR	D
	5345	<i>Geranium gardneri</i>	Rough Cranesbill	VU	D1
✓	1427	<i>Geranium homeanum</i>	Northern Cranesbill	EN	D
	1431	<i>Geranium potentilloides</i>	Cinquefoil Cranesbill	LC	

⁶ The identity of most trees claimed to be *E. fulgens* is either questionable or a hybrid between two unrelated species.

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	5336	<i>Geranium retrorsum</i>	Grassland Cranesbill	VU	D1, D2
✓	5337	<i>Geranium solanderi</i>	Austral Cranesbill	EN	D
✓	5350	Geranium sp. 14	Valley Cranesbill	EN	D
	5343	<i>Geranium</i> sp. 2	Variable Cranesbill	LC	
✓	5344	Geranium sp. 3	Pale-flowered Cranesbill	EN	C2(ai), D
	5346	<i>Geranium</i> sp. 5	Naked Cranesbill	CR ⁷	D
✓	1445	<i>Glossodia major</i>	Wax-lip Orchid	EN	C2(ai)
✓	1449	<i>Glossostigma elatinoides</i>	Small Mud-mat	VU	C2(ai)
	1451	<i>Glyceria australis</i>	Australian Sweet-grass	VU	C1, C2(ai)
	4539	<i>Glycine clandestina</i>	Twining Glycine	VU	A2, A4, C1
	3741	<i>Glycine microphylla</i>	Small-leaf Glycine	VU	D1
✓	3739	<i>Glycine tabacina</i>	Variable Glycine	VU	D1, D2
	1464	<i>Gnaphalium indutum</i>	Tiny Cudweed	VU	D1
✓	1481	<i>Gompholobium huegelii</i>	Common Wedge-pea	CR	D
✓	1484	<i>Gonocarpus humilis</i>	Shade Raspwort	CR	D
	1489	<i>Gonocarpus tetragynus</i>	Common Raspwort	VU	A2
✓	1496	<i>Goodenia elongata</i>	Lanky Goodenia	CR	C2(ai)
✓	1503	<i>Goodenia humilis</i>	Swamp Goodenia	CR	C2(ai), C2(aii), D
✓	1504	<i>Goodenia lanata</i>	Trailing Goodenia	CR	D
	1507	<i>Goodenia ovata</i>	Hop Goodenia	VU	A2
✓	1509	<i>Goodenia pinnatifida</i>	Cut-leaf Goodenia	EN	D
✓	5076	<i>Goodia lotifolia</i> var. <i>lotifolia</i>	Common Golden-tip	CR	D
✓	1524	<i>Gratiola peruviana</i>	Austral Brooklime	EN	C2(ai)
✓	3747	<i>Gratiola pubescens</i>	Glandular Brooklime	CR	C2(ai)
✓	3853	<i>Gynatrix pulchella</i>	Hemp Bush	EN	D
✓	5070	<i>Hakea decurrens</i>	Bushy Needlewood	CR	D
✓	1568	<i>Hakea nodosa</i>	Yellow Hakea	CR	D
✓	1584	<i>Haloragis heterophylla</i>	Varied Raspwort	CR	C2(ai)
	1596	<i>Hardenbergia violacea</i>	Purple Coral-pea		
	2762	<i>Helichrysum luteoalbum</i>	Jersey cudweed	NT	D
	1626	<i>Helichrysum scorpioides</i>	Button Everlasting	VU	C1
	1654	<i>Hemarthria uncinata</i>	Mat Grass	VU	C2(ai)
✓	1671	<i>Hibbertia obtusifolia</i>	Grey Guinea-flower	EN	D
✓	1675	<i>Hibbertia riparia</i>	Erect Guinea-flower	CR	D
✓	1691	<i>Histiopteris incisa</i>	Bat's Wing Fern	CR	D
	1705	<i>Hovea heterophylla</i>	Common Hovea		
✓	1643	<i>Hyalosperma demissum</i>	Moss Sunray	EN	D
	1718	<i>Hydrocotyle callicarpa</i>	Small Pennywort	VU	D1
	1720	<i>Hydrocotyle foveolata</i>	Yellow Pennywort	VU	D1
	1722	<i>Hydrocotyle hirta</i>	Hairy Pennywort	NT	
	1723	<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	LC	
✓	1726	<i>Hydrocotyle pterocarpa</i>	Wing Pennywort	EN	D
	1728	<i>Hydrocotyle sibthorpioides</i>	Shining Pennywort	⁸	
✓	1729	<i>Hydrocotyle tripartita</i>	Slender Pennywort	CR	D
		<i>Hymenantha</i> – see <i>Melicytus</i>			
✓	1734	<i>Hymenophyllum cupressiforme</i>	Common Filmy Fern	CR	C2(ai)
	1741	<i>Hypericum gramineum</i>	Small St John's Wort		
✓	1743	<i>Hypericum japonicum</i>	Matted St John's Wort	CR	C2(aii)
✓	1752	<i>Hypolepis glandulifera</i>	Downy Ground-fern	CR	D
✓	1751	<i>Hypolepis muelleri</i>	Harsh Ground-fern	CR	D
✓	1753	<i>Hypolepis rugosula</i>	Ruddy Ground-fern	CR	D
✓	1755	<i>Hypoxis glabella</i> var. <i>glabella</i>	Tiny Star	VU	D1, D2
✓	4591	<i>Hypoxis hygrometrica</i> var. <i>villosisepala</i>	Golden Weather-glass	EN	D
	3778	<i>Hypoxis vaginata</i>	Sheath Star	VU	D1

⁷ *Geranium* sp. 5 may or may not be native to Australia. If not, it does not qualify as a locally threatened species.

⁸ *Hydrocotyle sibthorpioides* may be represented in Manningham by two separate taxa: one that volunteers in well-watered lawns and another (rare) taxon in wet, natural habitat.

Planning Protection?	Code no.	Scientific Name	Common Name	Threat Category	Red List Criteria
✓	1760	<i>Imperata cylindrica</i>	Blady Grass	CR	C2(ai)
✓	1761	<i>Indigofera australis</i>	Austral Indigo	CR	C2(ai), D
✓	1768	<i>Isoetopsis graminifolia</i>	Grass Cushion	CR	D
✓	1772	<i>Isolepis cernua</i> var. <i>cernua</i>	Nodding Club-rush	CR	C2(ai), C2(b)
✓	1783	<i>Isolepis cernua</i> var. <i>platycarpa</i>	a Club-rush	CR	C2(ai), C2(b)
✓	1775	<i>Isolepis fluitans</i>	Floating Club-rush	CR	C2(ai)
✓	1777	<i>Isolepis hookeriana</i>	Grassy Club-rush	CR	C2(ai), C2(b)
	1779	<i>Isolepis inundata</i>	Swamp Club-rush	VU	C1
✓	1780	<i>Isolepis marginata</i>	Little Club-rush	CR	C2(b)
✓	1793	<i>Isotoma fluviatilis</i> subsp. <i>australis</i>	Swamp Isotome	CR	C2(ai), D
	1803	<i>Juncus amabilis</i>	Hollow Rush	VU	C1
✓	1808	<i>Juncus australis</i>	Austral Rush	CR	C2(ai)
	1810	<i>Juncus bufonius</i>	Toad Rush	LC	
✓	1818	<i>Juncus flavidus</i>	Yellow Rush	CR	C2(ai), D
	1820	<i>Juncus gregiflorus</i>	Green Rush	EN	C1
✓	1821	<i>Juncus holoschoenus</i>	Joint-leaf Rush	CR	C2(ai)
✓	1825	<i>Juncus ingens</i>	Giant Rush	EN	D
	1830	<i>Juncus pallidus</i>	Pale Rush	VU	C1
✓	1831	<i>Juncus pauciflorus</i>	Loose-flower Rush	EN	D
✓	1833	<i>Juncus planifolius</i>	Broad-leaf Rush	EN	C1, C2(b)
✓	1834	<i>Juncus prismatocarpus</i>	Branching Rush	CR	C2(ai), D
✓	1835	<i>Juncus procerus</i>	Tall Rush	CR	C2(ai)
	1841	<i>Juncus sarophorus</i>	Broom Rush	VU	C1
✓	1843	<i>Juncus subsecundus</i>	Finger Rush	CR	C2(ai)
✓	1845	<i>Juncus usitatus</i>	Rush	CR	D
✓	1846	<i>Juncus vaginatus</i>	Clustered Rush	CR	C2(ai), D
✓	1847	<i>Kennedia prostrata</i>	Running Postman	CR	C2(ai)
	1856	<i>Kunzea ericoides</i> spp. agg.	Burgan	LC	
✓	4205	<i>Lachnagrostis aemula</i>	Purplish Blown Grass	CR	C1, C2(ai)
	151	<i>Lachnagrostis filiformis</i>	Common Blown Grass	LC	
	1861	<i>Lagenophora gracilis</i>	Slender Lagenophora		
✓	1862	<i>Lagenophora huegelii</i>	Coarse Lagenophora	CR	C2(ai), C2(aii), D
	1863	<i>Lagenophora stipitata</i>	Common Lagenophora		
✓	3224	<i>Landoltia punctata</i>	Thin Duckweed	EN	C1, C2(b)
	1893	<i>Lemna disperma</i>	Common Duckweed	NT	A2
✓	1908	<i>Lepidium pseudohyssopifolium</i>	Pepper-cress	CR	D
✓	1910	<i>Lepidium pseudotasmanicum</i>	Shade Pepper-cress	CR	D
✓	1919	<i>Lepidosperma elatius</i>	Tall Sword-sedge	EN ⁹	D
	4699	<i>Lepidosperma gunnii</i>	Slender Sword-sedge		
	1923	<i>Lepidosperma laterale</i>	Variable Sword-sedge	LC	
✓	540	<i>Leptoceras menziesii</i>	Hare Orchid	EN	D
✓	5610	<i>Leptorhynchos squamatus</i>	Scaly Buttons	EN	D
	1947	<i>Leptorhynchos tenuifolius</i>	Wiry Buttons		
✓	1956	<i>Leptospermum continentale</i>	Prickly Tea-tree	CR	C2(ai)
✓	1958	<i>Leptospermum lanigerum</i>	Woolly Tea-tree	CR	C2(aii)
✓	1964	<i>Leptospermum obovatum</i>	River Tea-tree	RE	
✓	1965	<i>Leptospermum scoparium</i>	Manuka	CR	C1
✓	1638	<i>Leucochrysum albicans</i>	Hoary Sunray	CR	D
✓	1978	<i>Leucopogon ericoides</i>	Pink Beard-heath		
✓	1997	<i>Levenhookia dubia</i>	Hairy Stylewort	VU	C2(aii), C2(b)
✓	1998	<i>Levenhookia sonderi</i>	Slender Stylewort	VU	C2(ai), C2(b), D
✓	2005	<i>Lilaeopsis polyantha</i>	Australian Lilaeopsis	CR	C2(ai), D
✓	2014	<i>Lindsaea linearis</i>	Screw Fern	CR	D
	2017	<i>Linum marginale</i>	Native Flax	VU	D1
✓	2021	<i>Lissanthe strigosa</i>	Peach Heath	CR	D
✓	2024	<i>Lobelia anceps</i>	Angled Lobelia	EN	C1, C2(ai)
✓	4703	<i>Lobelia gibbosa</i> var. <i>gibbosa</i>	Tall Lobelia	CR	D

⁹ *Lepidosperma elatius* should be monitored for the first signs of decline from drying climate.

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✓	2730	<i>Lobelia pedunculata</i>	Matted Pratia	VU	C1, D2
✓	4704	<i>Lobelia simplicicaulis</i>	Narrow Lobelia	CR	D
	4709	<i>Lomandra filiformis</i> subsp. <i>coriacea</i>	Wattle Mat-rush	VU	A2c
	4710	<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	Wattle Mat-rush	VU	A2c
	2046	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	VU	A2ce
✓	2048	<i>Lomandra multiflora</i>	Many-flowered Mat-rush	CR	D
✓	3843	<i>Lomandra nana</i>	Dwarf Mat-rush	VU	A2c, D1, D2
	2052	<i>Lomatia myricoides</i>	River Lomatia	VU	D1
	3841	<i>Luzula meridionalis</i>	Common Woodrush	VU	C1
✓	2085	<i>Lycopus australis</i>	Australian Gipsywort	EN	C2(ai)
✓	2087	<i>Lyperanthus suaveolens</i>	Brown-beaks	VU	D2
	2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife	EN	C1
✓	2093	<i>Lythrum salicaria</i>	Purple Loosestrife	CR	D
✓	2127	<i>Marsilea drummondii</i>	Common Nardoo	CR	C2(ai), C2(aii), C2(b), D
✓	2133	<i>Mazus pumilio</i>	Swamp Mazus	VU	C1, D2
	2147	<i>Melaleuca ericifolia</i>	Swamp Paperbark	VU	C1, C2(ai)
✓	2154	<i>Melaleuca parvistaminea</i>	Rough-barked Honey-myrtle	CR	D
✓	4933	<i>Melicytus dentatus</i>	Tree Violet	EN	C2(ai), D
✓	2165	<i>Mentha australis</i>	River Mint	CR	C2(ai), D
	2179	<i>Microlaena stipoides</i>	Weeping Grass	LC	
✓	3887	<i>Microseris</i> sp. 3	Foothill Yam-daisy	EN	C2(ai)
✓	2183	<i>Microsorium pustulatum</i>	Kangaroo Fern	CR	C2(ai), D
✓	2185	<i>Microtidium atratum</i>	Yellow Onion-orchid	RE	
✓	2258	<i>Microtis arenaria</i>	Sand Onion-orchid	CR	D
	2187	<i>Microtis parviflora</i>	Slender Onion-orchid	LC	
✓	2188	<i>Microtis rara</i>	Sweet Onion-orchid	CR	D
	2189	<i>Microtis unifolia</i>	Common Onion-orchid		
✓	2192	<i>Millotia tenuifolia</i> var. <i>tenuifolia</i>	Soft Millotia	CR	C2(b), D
✓	2233	<i>Muellerina eucalyptoides</i>	Creeping Mistletoe	CR	C1, C2(ai), D
✓	2244	<i>Myosotis australis</i>	Austral Forget-me-not	CR	D
✓	2251	<i>Myriophyllum amphibium</i>	Broad Milfoil	RE	
✓	2253	<i>Myriophyllum caput-medusae</i>	Coarse Milfoil	CR	D
✓	3867	<i>Myriophyllum crispatum</i>	Upright Milfoil	VU	C1, C2(ai), D1, D2
✓	3873	<i>Myriophyllum simulans</i>	Amphibious Milfoil	EN	C2(ai)
✓	2916	<i>Myrsine howittiana</i>	Muttonwood	EN	D
✓	2221	<i>Neopaxia australasica</i>	White Purslane	EN	C2(ai), D
		<i>Notodanthonia</i> – see <i>Rytidosperma</i>			
✓	2299	<i>Olearia argophylla</i>	Musk Daisy-bush	CR	C2(ai), D
✓	2312	<i>Olearia lirata</i>	Snowy Daisy-bush	CR	C2(ai)
✓	2316	<i>Olearia myrsinoides</i>	Silky Daisy-bush	CR	D
✓	4781	<i>Olearia phlogopappa</i>	Dusty Daisy-bush	CR	C2(ai), D
✓	2322	<i>Olearia ramulosa</i>	Twiggy Daisy-bush	CR	C2(ai), D
	2341	<i>Opercularia ovata</i>	Broad-leaf Stinkweed		
	2344	<i>Opercularia varia</i>	Variable Stinkweed		
✓	2345	<i>Ophioglossum lusitanicum</i>	Austral Adder's-tongue	EN	D
✓	2375	<i>Ottelia ovalifolia</i>	Swamp Lily	CR	C2 (ai), D
	7311	<i>Oxalis exilis/perennans</i>	Wood-sorrel		
	2391	<i>Oxalis thompsoniae</i>¹⁰	Thompson's Wood-sorrel		
	1616	<i>Ozothamnus ferrugineus</i>	Tree Everlasting	EN	A2ace
✓	1620	<i>Ozothamnus obcordatus</i>	Grey Everlasting	CR	D
	2399	<i>Pandorea pandorana</i> ¹¹	Wonga Vine	NA	
	5036	<i>Parietaria debilis</i>	Shade Pellitory	CR	D
✓	2426	<i>Parsonsia brownii</i>	Twining Silkpod	CR	D
✓	2442	<i>Pelargonium australe</i>	Austral Stork's-bill	CR	D

¹⁰ *Oxalis thompsoniae* is described in *Flora of Victoria* as 'A weedy species...mainly from disturbed situations in urban areas'. No assessment is done here of its extinction risk because it is questionably indigenous.

¹¹ See the discussion about this new immigrant to Manningham in '*Locally Threatened Plants in Manningham*'.

Planning Protection?	Code no.	Scientific Name	Common Name	Threat Category	Red List Criteria
✓	2446	<i>Pelargonium inodorum</i>	Kopata	EN	D
✓	2449	<i>Pellaea falcata</i>	Sickle Fern	CR	D
	2456	<i>Pentapogon quadrifidus</i>	Five-awned Spear-grass	EN	D
	3919	<i>Persicaria decipiens</i>	Slender Knotweed	VU	A2
	2628	<i>Persicaria hydropiper</i>	Water-pepper	VU	D1
	2630	<i>Persicaria lapathifolia</i>	Pale Knotweed	VU	D1
✓	3938	<i>Persicaria praetermissa</i>	Spotted Knotweed	EN	C2(ai)
	2635	<i>Persicaria prostrata</i>	Creeping Knotweed	VU	D1
✓	2637	<i>Persicaria subsessilis</i>	Hairy Knotweed	EN	C2(ai)
✓	531	<i>Pheladenia deformis</i>	Bluebeard Caladenia	RE	
	2497	<i>Phragmites australis</i>	Common Reed	VU	A2
✓	2209	<i>Phyllangium divergens</i>	Wiry Mitrewort	CR	D
✓	4832	<i>Pimelea curviflora</i>	Curved Rice-flower	EN	D
✓	2521	<i>Pimelea glauca</i>	Smooth Rice-flower	CR	D
	2523	<i>Pimelea humilis</i>	Common Rice-flower	VU	C1
✓	4819	<i>Pimelea linifolia</i> subsp. <i>linifolia</i>	Slender Rice-flower	EN	C2(ai)
✓	2528	<i>Pimelea pauciflora</i>	Poison Rice-flower	CR	D
	2555	<i>Plantago debilis</i>	Shade Plantain	NT	
	2566	<i>Plantago varia</i>	Variable Plantain	VU	C1
✓	2568	<i>Platylobium formosum</i>	Handsome Flat-pea	CR	D
✓	2569	<i>Platylobium obtusangulum</i>	Common Flat-pea	VU	C1, C2(ai)
✓	5453	<i>Pleurosorus rutifolius</i> s.s.	Blanket Fern	CR	A2a, C1, C2(ai), D
	2590	<i>Poa ensiformis</i>	Purple-sheathed Tussock-grass	VU	A2ace
✓	4694	<i>Poa labillardierei</i>	Common Tussock-grass	VU	C1, C2(ai), D1
	2602	<i>Poa morrisii</i>	Soft Tussock-grass	VU	A2ace
✓	2609	<i>Poa rodwayi</i> ¹²	Velvet Tussock-grass	VU	C2(ai)
✓	4834	<i>Poa sieberiana</i> var. <i>hirtella</i>	Grey Tussock-grass	EN	D
	4835	<i>Poa sieberiana</i> var. <i>sieberiana</i>	Grey Tussock-grass		
✓	2610	<i>Poa tenera</i>	Slender Tussock-grass	CR	A2
✓	2617	<i>Podolepis jaceoides</i> s.l.	Showy/Basalt Podolepis	EN	D
✓	2634	<i>Polygonum plebeium</i>	Small Knotweed	CR	C2a(i), D
✓	4634	<i>Polyscias sambucifolia</i> subsp. 1	Broad-leaf Panax	CR	D
✓	2645	<i>Polystichum proliferum</i>	Mother Shield-fern	CR	C2(ai), D
	2650	<i>Pomaderris aspera</i>	Hazel Pomaderris	VU	C1
✓	2663	<i>Pomaderris elliptica</i>	Smooth Pomaderris	CR	D
	2670	<i>Pomaderris prunifolia</i>	Plum-leaf Pomaderris	NT	
✓	2671	<i>Pomaderris racemosa</i>	Cluster Pomaderris	VU	D1
✓	2675	<i>Pomaderris vacciniifolia</i>	Round-leaf Pomaderris	RE	
	7704	<i>Poranthera microphylla</i> s.s.	Small Poranthera	LC	
✓	2693	<i>Potamogeton cheesmanii/tepperi</i>	Floating Pondweed	CR	C2(ai), D
✓	2688	<i>Potamogeton crispus</i>	Curly Pondweed	VU	D1
✓	2690	<i>Potamogeton ochreatus</i>	Blunt Pondweed	VU	D1
✓	2703	<i>Prasophyllum brevifolium</i>	Short-lip Leek-orchid	CR	D
✓	2717	<i>Prasophyllum odoratum</i> s.l.	Sweet Leek-orchid	CR	D
✓	4871	<i>Prasophyllum pyriforme</i> s.s.	Silurian Leek-orchid	RE	
	4845	<i>Prostanthera lasianthos</i>	Victorian Christmas-bush	VU	C1
	2777	<i>Pteridium esculentum</i>	Austral Bracken		
✓	2779	<i>Pteris tremula</i>	Tender Brake	CR	D
✓	4873	<i>Pterostylis alpina</i>	Mountain Greenhood	CR	C2(ai)
✓	2807	<i>Pterostylis atrans</i>	Dark-tip Greenhood	CR	D
✓	2789	<i>Pterostylis concinna</i>	Trim Greenhood	EN	A2c, C1
✓	2791	<i>Pterostylis curta</i>	Blunt Greenhood	CR	C2(ai)
✓	2798	<i>Pterostylis grandiflora</i>	Cobra Greenhood	CR	A2ac, C1, C2(ai), C2(aii), D
	4131	<i>Pterostylis melagramma</i>	Tall Greenhood	VU	A2ce
✓	2805	<i>Pterostylis nana</i>	Dwarf Greenhood	EN	C1(ai), D

¹² Plants classified as *Poa rodwayi* in Victoria may not actually belong to that species. Genetic research is required to determine the relationship to the common *Poa morrisii*.

Planning Protection?	Code no.	Scientific Name	Common Name	Threat Category	Red List Criteria
	2806	<i>Pterostylis nutans</i>	Nodding Greenhood	CR	A2c
✓	4033	<i>Pterostylis parviflora</i> s.s.	Tiny Greenhood	CR	D
✓	5293	<i>Pterostylis</i> sp. aff. <i>parviflora</i> (southern Victoria)	Eastern Tiny Greenhood	CR	D
✓	2810	<i>Pterostylis pedunculata</i>	Maroon-hood	VU	C1
✓	2811	<i>Pterostylis plumosa</i> s.l.	Bearded Greenhood	CR	C2(ai), D
✓	2814	<i>Pterostylis</i> sp. aff. <i>revoluta</i>	Autumn Greenhood	RE	
✓	2816	<i>Pterostylis squamata</i>	Rusty-hood	EN	C2(ai)
✓	4138	<i>Pultenaea gunnii</i>	Golden Bush-pea	EN	A2ac
✓	2864	<i>Pultenaea pedunculata</i>	Matted Bush-pea	CR	D
✓	2871	<i>Pultenaea scabra</i>	Rough Bush-pea	CR	D
✓	2086	<i>Pyrorchis nigricans</i>	Red-beaks	CR	D
✓	2907	<i>Ranunculus amphitrichus</i>	Small River Buttercup	CR	C2(ai)
✓	2890	<i>Ranunculus glabrifolius</i>	Shining Buttercup	CR	A2
✓	2893	<i>Ranunculus inundatus</i>	River Buttercup	CR	C2(ai)
✓	2894	<i>Ranunculus lappaceus</i>	Australian Buttercup	EN	C2(ai)
✓	2904	<i>Ranunculus plebeius/scapiger</i>	a buttercup	CR	D
✓	4910	<i>Ranunculus pumilio</i> var. <i>pumilio</i>	Fan-leaf Buttercup	EN	D
	4912	<i>Ranunculus sessiliflorus</i>	Annual Buttercup	LC	
✓	2956	<i>Rubus parvifolius</i>	Small-leaf Bramble	EN	C2(ai)
✓	2967	<i>Rumex bidens</i>	Mud Dock	CR	C2(ai), D
	2968	<i>Rumex brownii</i>	Slender Dock	VU	D1
	961	<i>Rytidosperma caespitosum</i>	Common Wallaby-grass	VU	D1
	964	<i>Rytidosperma erianthum</i>	Hill Wallaby-grass	NT	D
	965	<i>Rytidosperma geniculatum</i>	Kneed Wallaby-grass	LC	
✓	966	<i>Rytidosperma indutum</i>	Shiny Wallaby-grass	CR	D
	967	<i>Rytidosperma laeve</i>	Smooth Wallaby-grass		
	4409	<i>Rytidosperma linkii</i> var. <i>fulvum</i>	Leafy Wallaby-grass	LC	
	973	<i>Rytidosperma pallidum</i>	Silvertop Wallaby-grass	LC	
	974	<i>Rytidosperma penicillatum</i>	Slender Wallaby-grass	VU	C1
	975	<i>Rytidosperma pilosum</i>	Velvet Wallaby-grass	LC	
	977	<i>Rytidosperma racemosum</i>	Clustered Wallaby-grass	LC	
✓	979	<i>Rytidosperma semiannulare</i>	Tasmanian Wallaby-grass	CR	C2(ai)
	4379	<i>Rytidosperma setaceum</i>	Bristly Wallaby-grass	LC	
	981	<i>Rytidosperma tenuius</i>	Purplish Wallaby-grass	LC	
✓	2999	<i>Sambucus gaudichaudiana</i>	White Elderberry	CR	C2(aii)
	3038	<i>Schoenoplectus tabernaemontani</i>	River Club-rush	VU	D1
	3039	<i>Schoenus apogon</i>	Common Bog-rush	EN	A2ac
✓	3048	<i>Schoenus maschalinus</i>	Leafy Bog-rush	CR	C2(ai), D
✓	3089	<i>Scutellaria humilis</i>	Dwarf Skullcap	CR	D
✓	3092	<i>Sebaea ovata</i>	Yellow Sebaea	CR	C2(ai), C2(b)
✓	4958	<i>Senecio bathurstianus</i>	a fireweed	CR	D
✓	3102	<i>Senecio biserratus</i>	Jagged Fireweed	CR	D
✓	7136	<i>Senecio campylocarpus</i>	Floodplain Groundsel	CR	C2(ai), C2(b), D
	3107	<i>Senecio glomeratus</i>	Annual Fireweed	EN	C2(ai)
	4959	<i>Senecio hispidulus</i>	Rough Fireweed	LC	
	3115	<i>Senecio linearifolius</i>	Fireweed Groundsel	NA ¹³	
✓	3119	<i>Senecio minimus</i>	Shrubby Fireweed	EN	A2ac
	3120	<i>Senecio odoratus</i>	Scented Groundsel	NA ¹⁴	
	3126	<i>Senecio prenanthoides</i>	Beaked Fireweed		
	3124	<i>Senecio quadridentatus</i>	Cotton Fireweed	LC	
✓	3125	<i>Senecio runcinifolius</i>	Tall Groundsel	CR	C2(ai), C2(b), D
✓	3149	<i>Sigesbeckia orientalis</i>	Indian Weed	CR	D
	2983	<i>Siloxerus multiflorus</i>	Small Wrinklewort	LC	
✓	3169	<i>Solanum aviculare</i>	Kangaroo Apple	CR	D
	3179	<i>Solanum laciniatum</i>	Large Kangaroo Apple	EN	D

¹³ *Senecio linearifolius* is regarded here as a vagrant, volunteering occasionally without reproducing.

¹⁴ As for *Senecio linearifolius*.

Planning Protection?	Code no.	Scientific Name	Common Name	Threat Category	Red List Criteria
✓	3186	<i>Solanum prinophyllum</i>	Forest Nightshade	CR	D
	3195	<i>Solenogyne dominii</i>	Solenogyne	LC	
	3196	<i>Solenogyne gunnii</i>	Solenogyne	VU	D1
✓	3223	<i>Spiranthes australis</i>	Ladies' Tresses	CR	D
✓	3235	<i>Spyridium parvifolium</i>	Australian Dusty Miller	EN	C2(ai)
✓	3244	<i>Stackhousia monogyna</i>	Candles	EN	C2(ai)
✓	3248	<i>Stellaria caespitosa</i>	Starwort	CR	C2(ai), D
✓	3250	<i>Stellaria flaccida</i>	Forest Starwort	CR	C2(ai)
✓	3252	<i>Stellaria multiflora</i>	Rayless Starwort	CR	D
✓	3255	<i>Stellaria pungens</i>	Prickly Starwort	CR	C2(ai)
	3300	<i>Stuartina muelleri</i>	Spoon Cudweed	LC	
✓	3998	<i>Styloidium despectum</i>	Small Trigger-plant	CR	C2(ai), C2(b)
	3303	<i>Styloidium armeria/graminifolium</i>	Grass Trigger-plant	VU	C2(ai)
✓	3347	<i>Tetrarrhena distichophylla</i>	Hairy Rice-grass	EN	D
✓	3348	<i>Tetrarrhena juncea</i>	Forest Wire-grass	CR	C2(ai)
✓	3351	<i>Tetradthea ciliata</i>	Pink-bells	EN	C2(ai)
✓	3357	<i>Teucrium corymbosum</i>	Forest Germander	CR	C2(ai), D
✓	3361	<i>Thelymitra antennifera</i>	Rabbit-ears	RE	
✓	5355	<i>Thelymitra arenaria</i>	Forest Sun-orchid	EN	D
✓	5916	<i>Thelymitra brevifolia</i>	Peppertop Sun-orchid	EN	D
✓	3368	<i>Thelymitra flexuosa</i>	Twisted Sun-orchid	RE	
✓	5005	<i>Thelymitra ixioides</i> s.s.	Dotted Sun-orchid	CR	C2(ai)
✓	4016	<i>Thelymitra juncifolia</i>	Rush Sun-orchid	CR	C2(ai), D
✓	3379	<i>Thelymitra media</i> s.l.	Tall Sun-orchid	CR	D
	5013	<i>Thelymitra pauciflora</i> s.s.	Slender Sun-orchid	VU	C2(ai)
✓	5914	<i>Thelymitra peniculata</i>	Trim Sun-orchid	EN	D
✓	3384	<i>Thelymitra rubra</i>	Salmon Sun-orchid	CR	C2(ai)
	3387	<i>Themeda triandra</i>	Kangaroo Grass	LC	
✓	268	<i>Thynninorchis huntianus</i>	Elbow Orchid	RE	
	3399	<i>Thysanotus patersonii</i>	Twining Fringe-lily	LC	
	3421	<i>Tricoryne elatior</i>	Yellow Rush-lily	LC	
	4073	<i>Triglochin procera</i> s.s.	Water-ribbons	VU	D1
	3449	<i>Triglochin striata</i>	Streaked Arrow-grass	VU	C2(ai)
	1640	<i>Triptilodiscus pygmaeus</i>	Common Sunray	LC	
	3468	<i>Typha domingensis</i>	Cumbungi	EN	A2ac
	3470	<i>Typha orientalis</i>	Cumbungi	EN	A2ac
	3476	<i>Urtica incisa</i>	Scrub Nettle	EN	C1
✓	4040	<i>Vallisneria americana</i>	Lake Eel-grass	VU	D1, D2
✓	3490	<i>Velleia paradoxa</i>	Spur Velleia	EN	A2, C1, C2(ai)
✓	3503	<i>Veronica calycina</i>	Hairy Speedwell	EN	D
✓	3506	<i>Veronica gracilis</i>	Slender Speedwell	EN	C1
	3512	<i>Veronica plebeia</i>	Trailing Speedwell	LC	
✓	3523	<i>Viminaria juncea</i>	Golden Spray	CR	D
✓	3526	<i>Viola betonicifolia</i>	Showy Violet	CR	C2(ai), D
	5058	<i>Viola hederacea</i>	Ivy-leaf Violet	VU	A2ace
✓	3529	<i>Viola sieberiana</i> spp. agg.	Tiny Violet	CR	D
✓	3537	<i>Vittadinia cuneata</i>	Fuzzy New Holland Daisy	EN	D
✓	3541	<i>Vittadinia muelleri</i>	Narrow-leaf New Holland Daisy	CR	C2(ai), D
✓	3551	<i>Wahlenbergia communis</i> s.l.	Tufted Bluebell	CR	D
✓	4124	<i>Wahlenbergia gracilentia</i> s.s.	Annual Bluebell	EN	D
	4069	<i>Wahlenbergia gracilis</i> s.s.	Sprawling Bluebell	LC	
✓	3556	<i>Wahlenbergia graniticola</i> ¹⁵	Granite Bluebell	VU	C1
✓	4059	<i>Wahlenbergia luteola</i>	Yellowish Bluebell	CR	D
✓	3560	<i>Wahlenbergia multicaulis</i>	Tadgell's Bluebell	CR	C2(ai), C2(b), D
✓	3559	<i>Wahlenbergia stricta</i>	Tall Bluebell	VU	C1
	3578	<i>Wolffia australiana</i>	Tiny Duckweed	VU	A2ac, C1
	4082	<i>Wurmbea dioica</i>	Common Early Nancy		

¹⁵ *Wahlenbergia graniticola* has been assessed in aggregate with *W. stricta*, consistent with most available data.

Planning Protection?	Code no.	Scientific Name	Common Name	Threat Category	Red List Criteria
✓	3588	<i>Xanthorrhoea minor</i>	Small Grass-tree	EN	A2c, C1
✓	4561	<i>Xanthosia dissecta</i>	Cut-leaf Xanthosia	EN	D
✓	1633	<i>Xerochrysum viscosum</i>	Shiny Everlasting	CR	D

Appendix B. Summary of IUCN Red List Criteria

The table below is reproduced from page 13 of IUCN (2008) and summarises the five criteria (A-E) used to assess the threat level of a species at the global scale. Figure 3 on the following page reproduces a diagram from IUCN (2003) that summarises the procedure for dealing with cross-border effects when the method is applied at scales below global.

Use any of the criteria A-E	Critically Endangered	Endangered	Vulnerable
A. Population reduction	Declines measured over the longer of 10 years or 3 generations		
A1	> 90%	> 70%	> 50%
A2, A3 & A4	> 80%	> 50%	> 30%
A1. Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible AND understood AND ceased based on and specifying any of the following:			
(a) direct observation			
(b) an index of abundance appropriate to the taxon			
(c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality			
(d) actual or potential levels of exploitation			
(e) effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.			
A2. Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible, based on any of (a) to (e) under A1			
A3. Population reduction projected or suspected to be met in the future (up to a maximum of 100 years) based on any of (b) to (e) under A1.			
A4. An observed, estimated, inferred, projected or suspected population reduction (up to a maximum of 100 years) where the time period must include both the past and the future, and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible, based on any of (a) to (e) under A1.			
B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy)			
B1. Either extent of occurrence	< 100 km ²	< 5,000 km ²	< 20,000 km ²
B2. or area of occupancy	< 10 km ²	< 500 km ²	< 2,000 km ²
and 2 of the following 3:			
(a) severely fragmented or # locations	= 1	≤ 5	≤ 10
(b) continuing decline in (i) extent of occurrence (ii) area of occupancy, (iii) area, extent and/or quality of habitat, (iv) number of locations or subpopulations and (v) number of mature individuals.			
(c) extreme fluctuations in any of (i) extent of occurrence, (ii) area of occupancy, (iii) number of locations or subpopulations and (iv) number of mature individuals.			
C. Small population size and decline			
Number of mature individuals and either C1 or C2:	< 250	< 2,500	< 10,000
C1. An estimated continuing decline of at least up to a maximum of 100 years	25% in 3 years or 1 generation	20% in 5 years or 2 generations	10% in 10 years or 3 generations
C2. A continuing decline and (a) and/or (b)			
(a i) # mature individuals in largest subpopulation	< 50	< 250	< 1,000
(a ii) or % mature individuals in one subpopulation =	90-100%	95-100%	100%
(b) extreme fluctuations in the number of mature individuals			
D. Very small or restricted population			
Either (1) number of mature individuals or (2) restricted area of occupancy	< 50 na	< 250 na	< 1,000 typically: AOO < 20km ² or # locations ≤ 5
E. Quantitative Analysis			
Indicating the probability of extinction in the wild to be at least	50% in 10 years or 3 generations (100 years max)	20% in 20 years or 5 generations (100 years max)	10% in 100 years

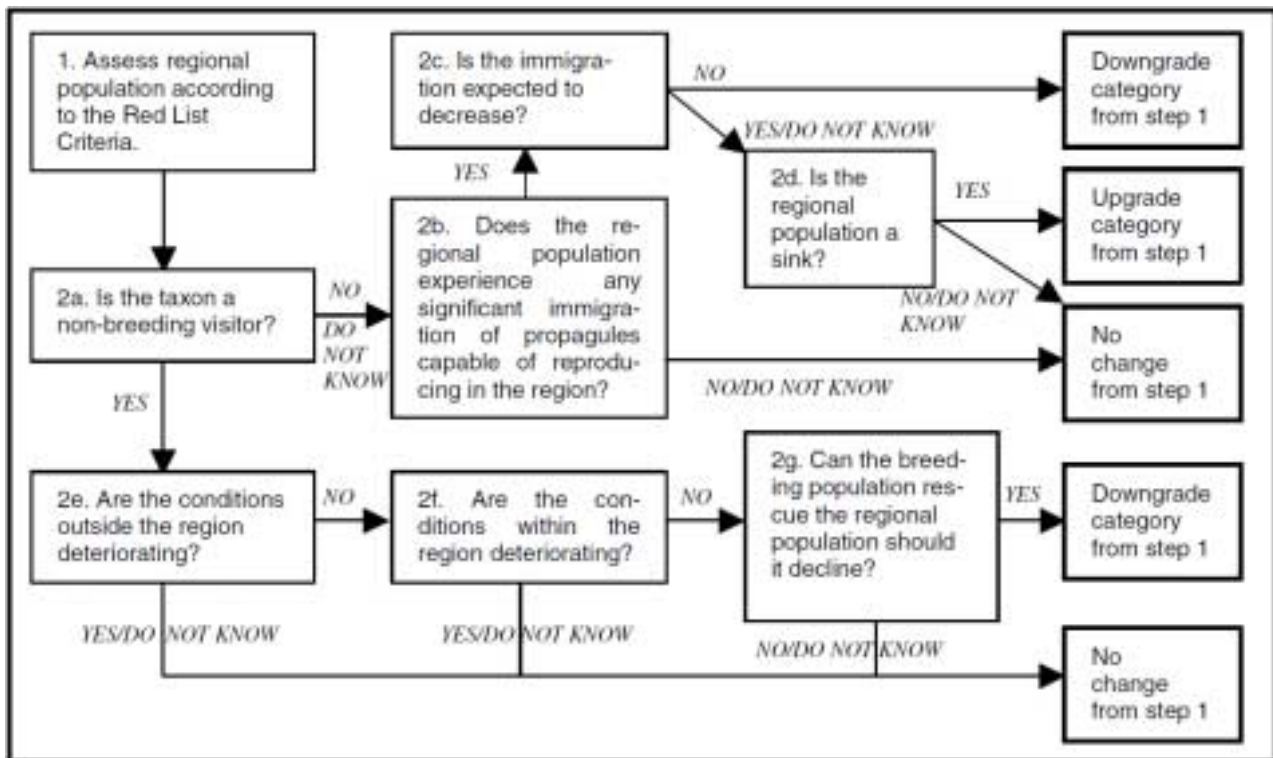


Figure 3. Conceptual scheme of the procedure for assigning an IUCN Red List category for a domain smaller than the whole globe. In step 1, all data used should be from the population in the domain of interest, not the global population. The exception is when evaluating a projected reduction or continued decline of a non-breeding population, in which cases conditions outside the region must be taken into account in step 1.