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When cities are the last chance for saving species

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In a nutshell

- Cities and towns can be important places for conservation and engaging people with nature
- Urban areas can also be the last places that threatened species persist, and represent the last opportunity to save such species from extinction.
- Conserving these urban-restricted threatened species requires looking beyond conventional conservation reserves and embracing a variety of marginal habitats and land-use types
- These species also benefit when community members are aware and engaged in local conservation action
- The role of urban environments in species conservation often goes unnoticed, and must be better recognised in policy and recovery planning

Abstract: Urban environments are arguably among the most fitting targets for conservation science: a golden opportunity to conserve species and ecosystems under threat, and allow people to engage with nature. Here, we reinforce the importance of urban conservation by highlighting the plight of urban-restricted threatened species – species whose recovery is entirely dependent on effective conservation within cities and towns. We identified 39 urban-restricted species in Australia, and reviewed their accompanying recovery documents to answer the question “What does conservation look like when cities are the last chance for saving species?” We argue that when cities are the last chance for saving species we cannot not depend on secure land tenures, and instead must better protect species on land not intended for conservation, and engage urban communities in conservation action. Ultimately, this depends on clear recognition of the role that urban environments play in a species recovery at all levels of decision making.

1 **Introduction**

2 Conservation biology has evolved from its traditional focus on ‘wild’ areas that are far removed from
3 human impacts (Kareiva and Marvier 2012, Soulé 1985). We now know that areas of intensive human
4 land-uses often coincide with biodiversity hotspots, threatened species, and ecosystems of
5 conservation concern (Ives, et al. 2016, Kowarik and von der Lippe 2018, Schwartz, et al. 2002,
6 Threlfall and Kendal 2018), and recognise the need for conservation action in landscapes (Blaustein
7 2013, Dunn, et al. 2006, Miller and Hobbs 2002). This need is perhaps most striking when a species’
8 entire distribution is contained within a landscape modified by human activity. For example,
9 McDonald et al. (2008) predicted that 24 IUCN-listed species restricted to only a single remaining
10 population would be affected by urban growth by the year 2030.

11 Still, conservation research and action in urban landscapes is an emerging field (Kowarik and von der
12 Lippe 2018, Shwartz, et al. 2014), that retains a persistent stigma (Klaus 2013, Salomon Cavin 2013,
13 Soanes, et al. 2018). ‘Urban’ is often placed at the opposite end of the ‘natural’ spectrum, and cast as
14 the anti-wilderness; a lost cause (Kowarik 2018, Miller and Hobbs 2002). This is reflected in policies
15 that focus on large, intact or undisturbed remnants (Kendal, et al. 2017, Tulloch, et al. 2016), in
16 conservation planning exercises that exclude urban areas from consideration, and in the behaviour and
17 attitudes of land managers and the community (Olive 2014, Stokes, et al. 2010). Consequently,
18 conservation opportunities within these areas of high-density human populations, built environments,
19 and small habitat remnants are underexploited and poorly understood. Yet urban environments are
20 arguably among the most fitting targets for conservation science: a golden opportunity to conserve
21 species and ecosystems under threat, and allow people to engage with, and benefit from, nature
22 (Kareiva and Marvier 2012, Soulé 1985).

23 Here, we reinforce the importance of urban conservation by highlighting the plight of urban-restricted
24 threatened species, for which urban environments represent the last chance to conserve species within
25 their natural range. We identified 39 nationally-threatened species whose current distribution is
26 wholly restricted to Australian cities and towns (Panel 1, Figure 1) and reviewed their recovery

27 documents (Panel 1) to answer the question, “What does conservation look like, when cities are the
28 last chance for saving species?”

29 **When cities are the last chance for saving species, we cannot rely on secure land tenures.**

30 A central tenet of conservation is to secure critical habitat through protected areas or conservation
31 covenants, particularly when remaining habitat is scarce. However, space in cities is limited. While
32 securing land tenures was recommended for 18 of the 39 urban-restricted threatened species, this will
33 be difficult to achieve in the urban realm. Existing green spaces are under pressure from urban infill
34 (Haaland and van den Bosch 2015, Hedblom, et al. 2017) while those on the fringes are vulnerable to
35 urban sprawl (Jim 2004, Seto, et al. 2011). The recovery documents for many urban-restricted
36 threatened species acknowledged this reality, noting that the high development potential (and thus,
37 associated cost) of the lands on which the species occurred placed many sites at significant risk.
38 Perhaps tellingly, residential and industrial developments were implicated in the decline of 26 species.
39 Their recovery documents described the loss of entire populations to development, even at sites that
40 were thought to contain the last remaining population. The Frankston spider-orchid (*Caladenia*
41 *robinsonii*) and small golden moths orchid (*Diuris basaltica*) were thought extinct when their ‘last
42 known’ sites were developed, and at least 15 species occur on lands zoned for future development
43 (e.g. Panel 2). Though this all seems dire for urban-restricted threatened species, conservation actions
44 are not limited to the formal protection of sites. A suite of approaches are available to enhance urban
45 environments, provide resources critical to species, and expand the range of suitable habitats available
46 through the principles of biodiversity-sensitive urban design or conservation developments (Aronson,
47 et al. 2014, Garrard, et al. 2018, Ikin, et al. 2015, Milder 2007). If secure tenure is a luxury that few
48 urban-restricted threatened species can afford, then we must embrace alternative approaches to avoid
49 losing them to extinction.

50 **When cities are the last chance for saving species, we must better protect species on land not**
51 **intended for conservation.**

52 By embracing a broader view of the land types suitable for conservation, we can open new avenues
53 for threatened species recovery in urban environments. Australia’s 39 urban-restricted threatened

54 species are not limited to remnants of native vegetation or reserves, but instead occur across diverse
55 land-use types (Figure 2), including roadsides (noted for 11 species), private land ($n=10$), defence
56 land ($n=5$), schools ($n=4$), golf courses ($n=4$), railways and utility easements ($n=4$), airports ($n=3$), a
57 cemetery ($n=1$) and a hospital ($n=1$). One of the largest known populations of the spiked rice flower
58 (*Pimelea spicata*) persists within a golf course, while the Bankstown guinea-flower (*Hibbertia*
59 *puberula* subsp. *glabrescens*) is known only from an airport. Therefore, the ongoing survival and
60 recovery of these species must incorporate actions on lands not originally intended for conservation.
61 For example, golf course managers are working to conserve the spiked rice flower, enhancing habitat
62 and raising awareness among residents and golfers. However, the potential for conservation gains in
63 unconventional spaces is not always recognised (Kowarik and von der Lippe 2018, Schwartz, et al.
64 2014). For many urban-restricted threatened species, sites that are small, highly modified, or no
65 longer support remnant vegetation are rarely prioritised – yet this is where species recovery must
66 occur. Opportunities range from protection and sympathetic management of existing populations, to
67 active habitat enhancement and establishment of new populations. Achieving conservation outcomes
68 without compromising the use of unconventional spaces depends on strong partnerships among a
69 range of stakeholders to balance competing land-use needs and values, and identify ‘win-wins’
70 (Aronson, et al. 2014, Rosenzweig 2003). Though this can be challenging, emerging success stories
71 highlight the potential rewards (Colding, et al. 2006, Ramírez-Restrepo, et al. 2017). Conversely,
72 failing to recognise the value of unconventional spaces can lead to the loss and damage of important
73 habitats (Panel 3).

74 **When cities are the last chance for saving species, we must engage the community in**
75 **conservation action.**

76 Being close to a large human population can pose many risks to threatened species in urban
77 environments (e.g. Panel 3). However, this proximity can be an advantage if the community is aware
78 and engaged in conservation action. Many of the urban-restricted threatened species that we identified
79 benefit from community conservation efforts. For example, the local community has been
80 instrumental in the management and recovery of the Frankston spider-orchid, with more than 1300

81 volunteer hours invested in improving habitat for the species' last remaining population. Such
82 engagement might not have been possible, and would certainly have been logistically difficult, had
83 the species occurred in a remote area. While most recovery documents (29 species) included broad
84 aims to raise awareness of a species' plight, there is a need to move beyond simply 'informing' the
85 public, to actively increasing their sense of ownership, participation, and stewardship in urban areas
86 (Andersson, et al. 2014). The urban-restricted threatened species presented here have great potential
87 to engender community care for *their* unique threatened species. For example, the Canberra spider-
88 orchid (*Caladenia actensis*), Sydney Plains greenhood (*Pterosytlis saxicola*) and Bomaderry zieria
89 (*Zieria baeuerlenii*) are all named for the area in which they occur – prime candidates as flagship
90 species to capitalise on community pride and sense of place through 'adoption' by local schools,
91 businesses or community groups. Though in some cases the precise location of threatened species
92 must be kept secret (Panel 4, Lindenmayer and Scheele 2017), the potential benefits of engaging and
93 inspiring community stewardship in species conservation are substantial (Andersson, et al. 2014,
94 Shwartz, et al. 2014). A 2016 crowd-funding campaign to "Save the sexy scented orchids" raised
95 more than \$18,000 from 144 contributors to support the conservation of the urban-restricted Sunshine
96 diuris (*Diuris fragrantissima*) and small golden moths orchid. Further, enabling community
97 stewardship and care for urban threatened species may also serve to re-engage people with nature,
98 leading to improved human health and well-being benefits (Dunn, et al. 2006, Shanahan, et al. 2015)
99 that are often the goal of environmental policy. Lastly, a consideration of the perspectives of
100 Indigenous communities was notably absent: approximately half ($n=18$) of the species' recovery
101 documents identified intent to consult with Indigenous peoples, while none described their
102 engagement in existing conservation activities. Formal recognition of the values, perspectives and
103 knowledge of Indigenous communities is not only likely to enrich and improve conservation
104 outcomes for these threatened species, but also acknowledges, and encourages the inclusion of,
105 cultural rights and relationship with Country within urban conservation practices (Leiper, et al. 2018).

106

107 **When cities are the last chance for saving species, we must *know* that cities are the last chance**
108 **for saving species.**

109 Urban environments are not always on the conservation radar – even when they are essential to a
110 species’ management and recovery. Research has repeatedly shown that biodiversity conservation in
111 urban environments receives insufficient attention in government policy and municipal planning (de
112 Oliveira, et al. 2011, Miller, et al. 2009, Olive and Minichiello 2013, Stokes, et al. 2010). Indeed, we
113 contend that many planners, land-managers and conservation scientists would be surprised to learn
114 that a threatened species’ distribution could be entirely urban, and that some of the more
115 ‘unconventional’ sites are critical to their persistence. In fact, it was rarely apparent in the recovery
116 documents that we reviewed that a species was urban-restricted. Several species lost key populations
117 because the relevant authorities or land managers were unaware of either the species occurrence, or
118 the importance of the urban site (Panel 2 and Panel 3). Under these circumstances, the conservation of
119 urban-restricted threatened species is relegated to the realm of damage control, rather than recovery.
120 People cannot protect what they are not aware of and will not protect that which seems unimportant.
121 For urban-restricted threatened species, this lack of awareness is a key factor limiting their
122 conservation and recovery. The awareness and understanding of urban conservation issues could be
123 improved in several ways. First and foremost, the documents and policy guiding a species recovery
124 should clearly acknowledge the urban nature of its distribution. Moreover, the presence of specialist
125 biodiversity conservation staff on planning or local government teams can improve the degree to
126 which biodiversity conservation is considered in decision-making (Miller, et al. 2009, Stokes, et al.
127 2010). These steps would act as both a ‘red flag’ to regulators and development proponents, as well as
128 bring urban-occurring threatened species into urban planning discourse to encourage and reward
129 proactive conservation actions in future developments.

130 **Concluding remarks**

131 Urban environments sometimes represent our last chance to conserve a species within its natural
132 range, and therefore are an essential piece of the conservation puzzle. The benefits of urban
133 conservation are clear – improved outcomes for species protection and recovery in line with

134 international commitments (de Oliveira, et al. 2011) and improved opportunities for the growing
135 urban human population to connect with nature (Kowarik 2018). Globally, the opportunities for cities
136 to play an important role in threatened species conservation abound. For example, approximately 22%
137 of nationally listed endangered plant species in the United States can be found in the 40 largest
138 metropolitan areas – just 8.4% of the total land area (Schwartz, et al. 2002); urban gardens are critical
139 to the resurgence of endangered *Eumaeus* butterfly species in Mexico (Ramírez-Restrepo, et al.
140 2017); while cities such as Cape Town, South Africa, and Ioannina, Greece, encompass significant
141 biodiversity hotspots and high species endemism (Kantsa, et al. 2013, Rebelo, et al. 2011). Our
142 review of urban-restricted threatened species in Australia reaffirms that urban environments not only
143 present key opportunities for biodiversity, but are also a necessary component of conservation.
144 Ideally, conservation approaches would consider the importance of urban landscapes *before* cities
145 become a species last chance – not just as an emergency response, but as part of a proactive
146 conservation strategy. However, success depends on adopting novel conservation and urban design
147 approaches, embracing opportunities and partnerships on unconventional lands, and fostering
148 community stewardship. Ultimately, this requires clear recognition of the role that urban
149 environments play in a species’ survival and future recovery at all levels of decision-making. When
150 cities are the last chance for saving species, we must stop overlooking the urban environment and start
151 putting conservation science into practice in the places where it is most needed.

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157 **Panel 1: A look at Australia’s urban-restricted threatened species**

158 To identify urban-restricted threatened species in Australia, we downloaded all point records for
159 species listed as threatened (‘vulnerable’, ‘endangered’, and ‘critically endangered’) under the
160 Australian Environment Protection and Biodiversity Conservation Act 1999 (as of February 2016)

161 from the Atlas of Living Australia website (<http://www.ala.org.au>). These points were cross-checked
162 against polygons representing 99 Australian towns and cities that have a population of >10,000 people
163 and for which the land character is predominantly described as ‘urban’ (see Ives et al. 2015 for detail).
164 This allowed us to create a short-list of species where all points recorded after the year 2000 fell
165 within or close to the boundary of an urban area. We then verified the validity of these records based
166 on 1) the associated spatial uncertainty (e.g. the observer/source), 2) descriptions of the species’
167 distribution presented within the Australian Government’s “Species Profiles and Threats Database”
168 (Department of Environment and Energy 2017), and 3) spatial data provided by the Australian
169 Government representing the ‘known’ ranges of the species (described in Ives et al. 2015). This
170 resulted in a list of 39 urban-restricted species (37 plants and two animals) which occurred in only one
171 or two Australian cities or towns (WebFigure 1, WebTable 1). We then reviewed the suite of
172 ‘recovery documents’ for each species (accessed through the Department of Environment and Energy,
173 2017) to ascertain the degree to which policy guidance supports their conservation within urban
174 environments, and identify key themes guiding urban conservation. A full description of the
175 documents reviewed for each species is available in WebTable 1. Urban-restricted species covered a
176 range of taxonomic groups and ecological traits that included orchids, flowering shrubs, large trees, a
177 tortoise, and a snail. The most commonly identified threats were urbanisation and habitat loss (89%),
178 invasive weeds (88%), and altered fire regimes (76%).

179

180 **Panel 2: Urban environments are critical to meeting conservation commitments**

181 No clearer are the ramifications of future development for conservation than in the case of Caley's
182 grevillea (Figure 3, *Grevillea caleyi*) – an urban-restricted threatened species targeted for recovery by
183 2020 in the Australian Government's *Threatened Species Strategy* (Department of the Environment
184 and Energy 2015). To date, more than 85% of the species' habitat has been cleared for urban growth,
185 with many remaining populations occurring on land zoned for development. Key challenges identified
186 in the recovery documents include the high development value of the land on which the species
187 occurs, a lack of awareness of the species' existence, and a lack of consultation among relevant
188 authorities prior to development occurring, resulting in the incremental loss of populations.

189 **Panel 3: A series of unfortunate events**

190 Conserving threatened species on land not intended for conservation can be fraught, with entire
191 populations seemingly one poor decision or stroke of bad luck away from extinction – a fact
192 exemplified by the tale of Angus's onion orchid (Figure 4, *Microtis angusii*). A roadside population in
193 northern Sydney has had a chequered past, despite being thought to support the only known
194 population at the time. In 1989, the entire orchid population was covered with ten tonnes of sand
195 when a utility company used the roadside to dump their construction fill, and attempts to correct the
196 problem involved a bulldozer and a high-pressure hose. Later, the site was used to host a telephone
197 company's portable toilets. Disaster struck again in 1999 when the site was heavily grazed during the
198 flowering season, and then again in 2007 when sprayed with herbicide. The future survival of urban-
199 restricted threatened species depends on collaboration and communication among key stakeholders to
200 avoid preventable incidents such as these.

201 **Panel 4: Loved to death?**

202 A perhaps unique challenge for many urban-restricted threatened species is the threat of being 'loved
203 to death'. One-quarter of the species on our list had been subject to, or were at risk of illegal
204 collection or deliberate destruction. Unfortunate side effects of eager naturalists searching for rare
205 plants in urban reserves include trampling, disturbing the plant or microclimate to get a good photo

206 opportunity, and even removing the plants entirely (Ballantyne and Pickering 2012). In such cases,
207 urban conservation must strike a balance between raising awareness to promote conservation
208 (Tulloch, et al. 2018) and maintaining secrecy to protect specific locations (Lindenmayer and Scheele
209 2017). For example, the recovery documents for the wavy-leaved smokebush (Figure 5,
210 *Conospermum undulatum*) highlight actions to promote awareness through an education campaign,
211 but also recommend that the location of the species be kept secret from the general public.

212

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296

Figure captions

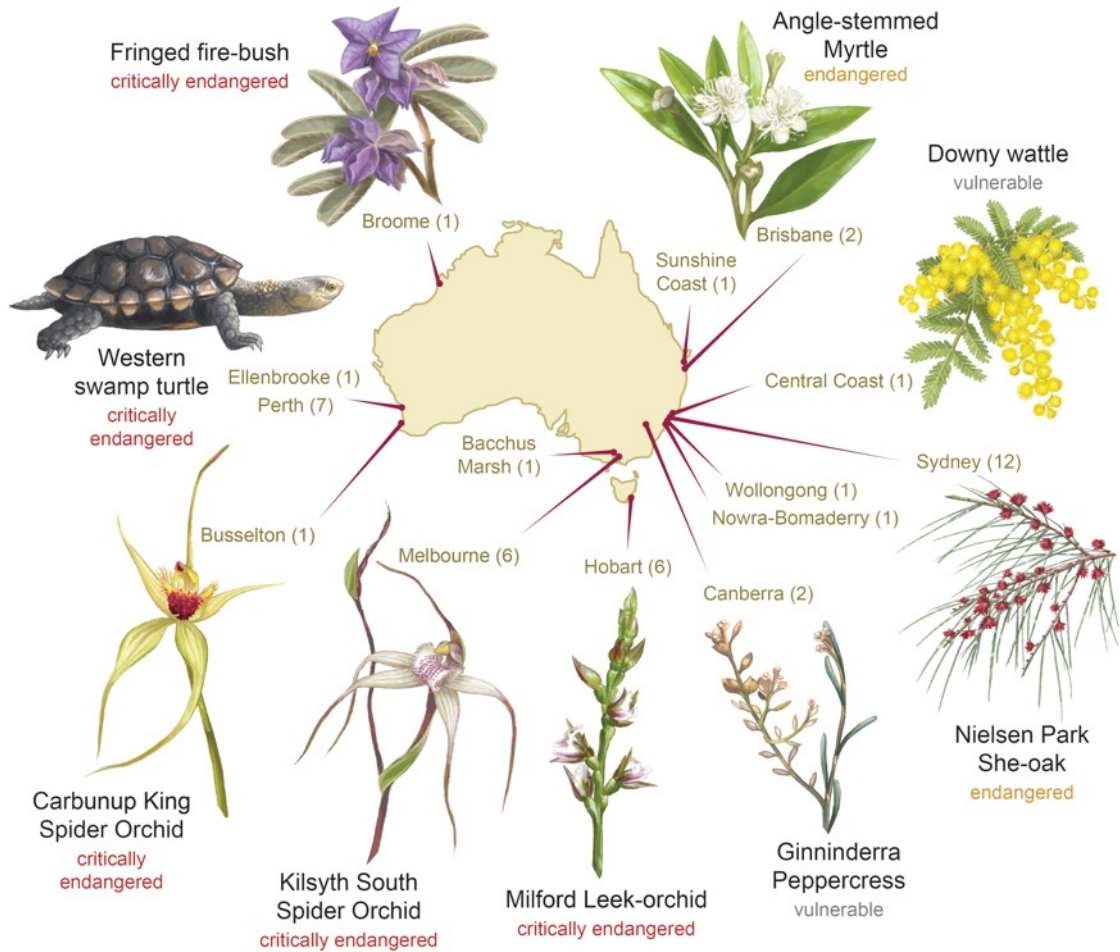


Figure 1 – The location of urban-restricted threatened species across Australia. The number of species per location is indicated in parentheses. Select examples have been illustrated, including the A) fringed fire-bush, critically endangered; B) western swamp tortoise, critically endangered; C) Carbinup king spider-orchid, critically endangered; D) Kilsyth South spider-orchid, critically endangered; E) Milford leek-orchid, critically endangered; F) Ginninderra peppercross, vulnerable; G) Nielsen Park she-oak, endangered; H) downy wattle, vulnerable; and I) angle-stemmed myrtle, endangered. Artwork by Elia Pirtle.



Figure 2 – Urban-restricted threatened species rely on a variety of land-use types, such as airports (Bankstown guinea, flower top left), golf courses (spiked rice flower, top right), railway verges (Sunshine diuris, bottom left), and roadsides (Seaforth mintbush, bottom right). Artwork by Elia Pirtle.



Figure 3 – Caley's grevillea (*Grevillea caleyi*), an endangered urban-restricted species continues to suffer incremental population losses due to urban development. Image courtesy of Isaac Mamott.



Figure 4 – For many years Angus' onion orchid (*Microtis angusii*) was known from only a single roadside in Sydney, a fact that did not prevent that particular site being subjected to various disturbances. Image courtesy of Marita Macrae.



Figure 5 - The wavy-leaved smokebush (*Conospermum undulatum*) is now restricted to the city of Perth, but its precise location is kept confidential. Image courtesy of Mark Brundrett.

Supplementary material

WebTable1

National recovery documents reviewed for each of the 39 urban-restricted threatened species in Australia. All documents were approved or adopted by the Office for the Minister of Environment, Department of Environment and Energy of the Australian Government at the time of review in 2016, and available on the Species Profile and Threats Database <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>. The documents types and the depth of information available varied among species, but included at least one of: a species profile, a Listing Advice, a Conservation Advice, or a Recovery Plan.

Species name	Common name	Cities present	Document types reviewed
<i>Acacia pubescens</i>	Downy Wattle	Sydney	Conservation Advice (TSSC 2016) Recovery Plan (NSW National Parks and Wildlife Service 2003)
<i>Acacia terminalis subsp. terminalis MS</i>	Sunshine Wattle	Sydney	Recovery Plan (Department of Environment Climate Change and Water (NSW) 2010)
<i>Allocasuarina portuensis</i>	Nielsen Park She-oak	Sydney	Conservation Advice (TSSC 2016) Recovery Plan (NSW National Parks and Wildlife Service 2000)
<i>Allocasuarina thalassoscopica</i>	NA	Sunshine Coast	Conservation Advice (TSSC 2008)
<i>Caladenia actensis</i>	Canberra Spider Orchid	Canberra	Listing Advice (2005) Recovery Plan (Frawley 2010)
<i>Caladenia amoena</i>	Charming Spider-orchid	Melbourne	Conservation Advice (TSSC 2016) Recovery Plan (Todd 2000)
<i>Caladenia procera</i>	Carbunup King Spider Orchid	Bussleton	Conservation Advice (TSSC 2008) Listing Advice (2009) Recovery Plan (Department of Environment and Conservation 2011)
<i>Caladenia robinsonii</i>	Frankston Spider-orchid	Melbourne	Conservation Advice (TSSC 2016) Recovery Plan (Backhouse, et al. 1999)
<i>Caladenia saggicola</i>	Sagg Spider-orchid	Hobart	Listing Advice (2001) Recovery Plan (Threatened Species Section 2017)

Species name	Common name	Cities present	Document types reviewed
<i>Caladenia sp. Kilsyth South</i> (<i>G.S.Lorimer 1253</i>)	Kilsyth South Spider-orchid	Melbourne	Conservation Advice (TSSC 2016) Listing Advice (2001) Recovery Plan (Coates, et al. 2002)
<i>Caladenia thysanochila</i>	Fringed Spider-orchid	Melbourne	Conservation Advice (TSSC 2016) Recovery Plan (Todd 2000)
<i>Calytrix breviseta subsp. breviseta</i>	Swamp Starflower	Perth	Conservation Advice (TSSC 2015) Recovery Plan (Luu and English 2004)
<i>Conospermum undulatum</i>	Wavy-leaved Smokebush	Perth	Recovery Plan (Department of Environment and Conservation 2009)
<i>Darwinia apiculata</i>	Scarp Darwinia	Perth	Recovery Plan (Department of Environment and Conservation 2009)
<i>Discocharopa vigena</i>	A land snail	Hobart	Conservation Advice (TSSC 2014) Listing Advice (2014)
<i>Diuris basaltica</i>	Small Golden Moths Orchid,	Bacchus Marsh, Melbourne	Recovery Plan (Backhouse and Lester 2010)
<i>Diuris fragrantissima</i>	Sunshine Diuris	Melbourne	Recovery Plan (Murphy, et al. 2008)
<i>Eucalyptus copulans</i>	Eucalyptus copulans	Sydney	Conservation Advice (TSSC 2014)
<i>Eucalyptus morrisbyi</i>	Morrisby's Gum	Hobart	Conservation Advice (TSSC 2016) Recovery Plan (Threatened Species Section 2006)
<i>Gossia gonoclada</i>	Angle-stemmed Myrtle	Brisbane	Conservation Advice (TSSC 2016) Recovery Plan (<i>Austromyrtus gonoclada</i> Recovery Team 2001)
<i>Grevillea caleyi</i>	Caley's Grevillea	Sydney	Conservation Advice (TSSC 2015) Recovery Plan (Department of Environment and Conservation 2004)
<i>Haloragodendron lucasii</i>	Hal	Sydney	Conservation Advice (TSSC 2008)
<i>Hibbertia basaltica</i>	Basalt Guinea-flower	Hobart	Conservation Advice (TSSC 2008) Listing Advice (2008)
<i>Hibbertia puberula subsp. glabrescens</i>	NA	Sydney	Conservation Advice (TSSC 2008) Listing Advice (2009)

Species name	Common name	Cities present	Document types reviewed
<i>Keraudrenia exastia</i>	Fringed Fire-bush	Broome	Conservation Advice (TSSC 2009) Listing Advice (2009)
<i>Lepidium ginninderrense</i>	Ginninderra Peppercress	Canberra	Conservation Advice (TSSC 2015) Listing Advice (2005)
<i>Lepidosperma rostratum</i>	Beaked Lepidosperma		Conservation Advice (TSSC 2008)
<i>Microtis angusii</i>	Angus's Onion Orchid	Sydney	Recovery Plan (Department of Environment Climate Change and Water (NSW) 2010)
<i>Notelaea ipsviciensis</i>	Cooneana Olive	Brisbane	Conservation Advice (TSSC 2009) Listing Advice (2009)
<i>Pherosphaera fitzgeraldii</i>	Dwarf Mountain Pine	Sydney	Conservation Advice (TSSC 2014)
<i>Pimelea spicata</i>	Spiked Rice-flower	Sydney, Wollongong	Conservation Advice (TSSC 2016) Recovery Plan (Department of Environment and Conservation 2005)
<i>Prasophyllum milfordense</i>	Milford Leek-orchid	Hobart	Conservation Advice (TSSC 2016) Listing Advice (2001) Recovery Plan (Threatened Species Section 2017)
<i>Prasophyllum perangustum</i>	Knocklofty Leek-orchid	Hobart	Conservation Advice (TSSC 2016) Listing Advice (2001) Recovery Plan (Threatened Species Section 2017)
<i>Prostanthera marifolia</i>	Seaforth Mintbush	Sydney	Conservation Advice (TSSC 2015)
<i>Pseudemydura umbrina</i>	Western Swamp Tortoise	Ellenbrook, Perth	Listing Advice (2004) Recovery Plan (Burbidge, et al. 2010)
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	Sydney	Conservation Advice (Department of the Environment Water Heritage and the Arts 2008)
<i>Ptilotus pyramidatus</i>	Pyramid Mulla-mulla	Perth	Conservation Advice (TSSC 2016)
<i>Trithuria occidentalis</i>	Swan Hydatella	Perth	Conservation Advice (Department of the Environment Water Heritage and the Arts 2008)

Species name	Common name	Cities present	Document types reviewed
<i>Zieria baeuerlenii</i>	Bomaderry Zieria	Nowra	Recovery Plan (Department of Environment Climate Change and Water (NSW) 2010)

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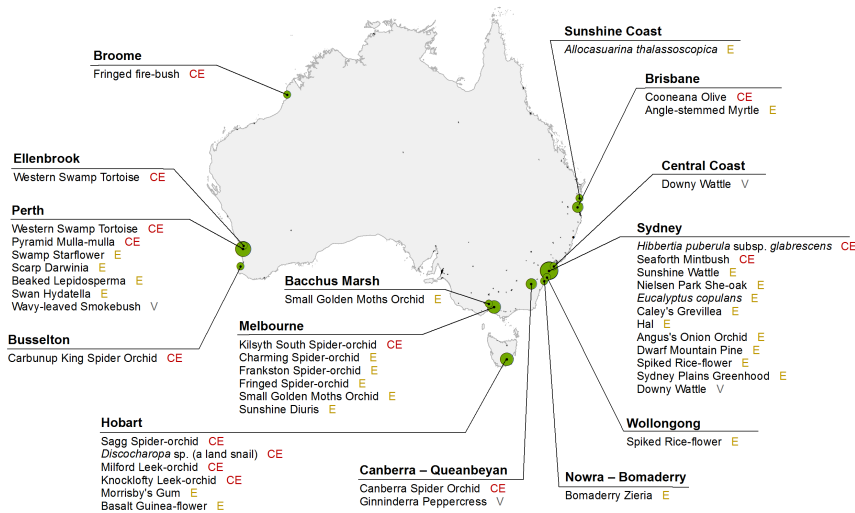
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127 **WebFigure 1**

128 Cities and towns across Australia that support the 39 urban-restricted threatened species. Australian
129 national (EPBC) threat categories are listed next to each species: critically endangered (CE),
130 endangered (E), and vulnerable (V). Common names are used except in cases where no common
131 name has been assigned; the full list of species common names, scientific names, and urban areas are
132 listed in WebTable1.

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