



**Draft guidance and criteria to  
assist a decision maker to  
determine a serious and  
irreversible impact**

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# Serious and irreversible impacts guidance, criteria and lists: explanatory information

The concept of serious and irreversible impacts (SAII) is a central component of the NSW biodiversity offsets scheme. It is fundamentally about protecting threatened species and threatened ecological communities that are most at risk of extinction from potential development impacts or activities.<sup>1</sup>

The *Biodiversity Conservation Act 2016* (BC Act) and the *Local Land Services Act 2013* (LLS Act) impose various obligations on decision-makers in relation to SAII on biodiversity values. These obligations generally require a decision-maker to determine whether or not any of the remaining impacts of a proposed development, activity, biodiversity certification or vegetation clearing on biodiversity values (that is, the impacts which would remain after any proposed avoid or minimise measures have been taken) are serious and irreversible.

To assist a decision-maker with this task, the BC Act (and the Biodiversity Regulation 2017 (BC Regulation)) provide a framework for the decision maker to determine if the remaining impacts of a proposal are likely to be serious and irreversible.

One aspect of this framework is the guidance and criteria provided by the Chief Executive of OEH under section 6.5 of the BC Act to assist decision makers with determining whether or not there are likely SAII in accordance with the principles in the BC Regulation. The aim of the guidance and criteria is to promote a consistent, objective and systematic approach to identifying and assessing potential SAII consistent with the principles in the BC Regulation.

The principles established by the BC regulation broadly align with the criteria prepared by the International Union for the Conservation of Nature (IUCN) (2000, Keith et al 2013) to assess the extinction risk of species and ecological communities. These criteria were derived by the IUCN from a wide review aimed at detecting extinction risk factors across a broad range of organisms and ecosystems.

The consistency of the principles with the IUCN criteria provides a transparent and robust approach and ensures that the principles can be quantitatively applied by a consent authority when determining a SAII. The approach supports the decision maker in their role to evaluate and determine whether a proposal will have a SAII.

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<sup>1</sup> References to threatened species in this document includes threatened populations listed in schedules under the BC Act

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# 1. Purpose and scope of guidance

This guidance is intended to assist decision makers<sup>2</sup> in determining whether or not an impact on biodiversity values is likely to be a serious and irreversible impact (SAII).

Section 6.5 of the *Biodiversity Conservation Act 2016* (the BC Act) allows the Chief Executive of the NSW Office of Environment and Heritage (OEH) to provide guidance to assist decision makers in making this determination in accordance with principles in the regulations. The guidance may also include criteria that assist in the application of the principles and lists of impacts that are potentially serious and irreversible.

The guidance:

- identifies 'candidate' species and ecological communities for SAII. Any impact on a candidate threatened species or ecological community in excess of thresholds, where relevant, is a potential SAII
- outlines a decision-making framework for decision-makers when considering potential SAII
- provides the decision maker with guidance on determining whether or not an impact is serious and irreversible.

The guidance and criteria assists with clear interpretation of the terms applied in the principles. The aim of the guidance and criteria is to provide a consistent, objective and systematic approach that assists decision-makers to determine whether an impact will be serious and irreversible.

This guidance is relevant for decisions under Parts 7 and 8 of the BC Act and Part 5A, Division 6 of the *Local Land Services Act 2013* (LLS Act).

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<sup>2</sup> The term 'decision maker' includes consent authorities for development applications under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), consent authorities for activities under Part 5.1 of the EP&A Act, determining authorities for activities under Part 5 of the EP&A Act, approvals for clearing native vegetation under s60ZF of the LLS Amendment Act and the Minister for Environment in relation to biodiversity certification under Part 8 of the BC Act 2016.

## 2. Regulatory context of serious and irreversible impacts

### 2.1 Principles for determining serious and irreversible impacts

Under the BC Act a determination of whether an impact is serious and irreversible must be made in accordance with principles in the BC Regulation.

Because of how the principles are expressed, a decision maker must effectively consider whether or not the impact is likely to contribute significantly to the risk of a species or ecological community becoming extinct. An impact will contribute significantly to the risk of a species or ecological community becoming extinct if it:

- will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline
- will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size
- is an impact on the habitat of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution, or
- is an impact on the species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

The first three principles broadly align with the criteria prepared by the IUCN in 2016 to assess the extinction risk of species and ecological communities. These criteria were derived by the IUCN from a wide review aimed at detecting extinction risk factors across a broad range of organisms.

### 2.2 What happens when a decision maker determines a proposal is likely to have a serious and irreversible impact on biodiversity values

Where the decision maker is of the opinion that a proposal is likely to have a serious and irreversible impact on biodiversity values, the BC Act and the LLS Act sets out the following requirements in relation to any approval or consent of the proposal.

Type of proposal	Role of the decision maker
Application for development consent under Part 4 of the EP&A Act (other than an application for state significant development or an application for a complying development certificate) See section 7.16(2) of the BC Act	Required to refuse to grant development consent
Application for development consent for state significant development or for approval for state significant infrastructure under the EP&A Act See section 7.16(3) of the BC Act	Required to: <ul style="list-style-type: none"> <li>• take likely SAIL into consideration, and</li> <li>• determine if there are any additional and appropriate measures that will minimise the impact if consent or approval is granted</li> </ul>

Type of proposal	Role of the decision maker
<p>Part 5 activity (where the proponent has elected to obtain a biodiversity assessment report under Division 2 of the BC Act) See section 7.16(4) of the BC Act</p>	<p>Required to:</p> <ul style="list-style-type: none"> <li>• take likely SAI into consideration, and</li> <li>• determine if there are any additional and appropriate measures that will minimise the impact if the activity is to be carried out or approved</li> </ul>
<p>Biodiversity certification of land See section 8.8(2) of the BC Act</p>	<p>Required to:</p> <ul style="list-style-type: none"> <li>• take likely SAI into consideration in determining the application, and</li> <li>• determine if there are any additional and appropriate measures that will minimise the impacts</li> </ul>
<p>Approval for clearing native vegetation under section 60ZF of the LLS Act</p>	<p>Required to refuse to grant approval</p>

### **3. Guidance for decision makers on determining SAI impacts**

#### **3.1 Decision makers evaluate impacts on candidate SAI entities**

Where a threatened species or ecological community will be impacted by a proposed development or activity, biodiversity certification proposal or other vegetation clearing, the decision maker must:

1. evaluate the impacts which will remain after the proposed measures to avoid and minimise impacts are taken, and
2. form an opinion on whether or not a proposal will have SAI on the threatened species or ecological community.

For state significant development/state significant infrastructure (SSD/SSI) proposals, Part 5 activities and biodiversity certification proposals, the decision maker is also required to determine if there are any additional and appropriate measures that will minimise this impact.

To assist decision makers, this guidance includes criteria that enables the application of the four principles in the regulation to identify the species and ecological communities that are likely to be the subject of SAI. These species and ecological communities are called 'candidate entities' for the purpose of the guidelines.

Criteria have been developed for each principle which are documented in Appendix 1. These criteria have been applied to all threatened species and threatened ecological communities listed under the BC Act. Entities that meet one or more of the criteria are identified on the lists of 'candidate entities' at Appendix 2 (for species) and Appendix 3 (for ecological communities). The specific principle/s and associated criteria that trigger the listing are also identified.

For example, Megalong Valley bottlebrush is included as a candidate species because, applying the principles in the regulation using the criteria, it has a very limited geographic distribution.

As such, candidate entities are those threatened species and ecological communities that have the greatest risk of a development proposal resulting in a SAI.

At a minimum, decision makers will need to evaluate the impacts on candidate SAI entities listed in Appendix 2 or Appendix 3 to determine whether any remaining impacts are likely to be serious and irreversible.

However, a consent authority may still consider whether a proposal will result in a SAI on other threatened species or ecological communities by applying the principles using the criteria.

#### **3.2 Framework for decision making**

The framework allows for decision makers to take into account the scale of an impact and the potential for avoidance and minimisation. These factors are weighed against the status and vulnerabilities of candidate SAI species to ultimately determine if a proposal will indeed have SAI.

Figure 1 outlines the decision making framework arriving at a determination of whether an impact is serious and irreversible.

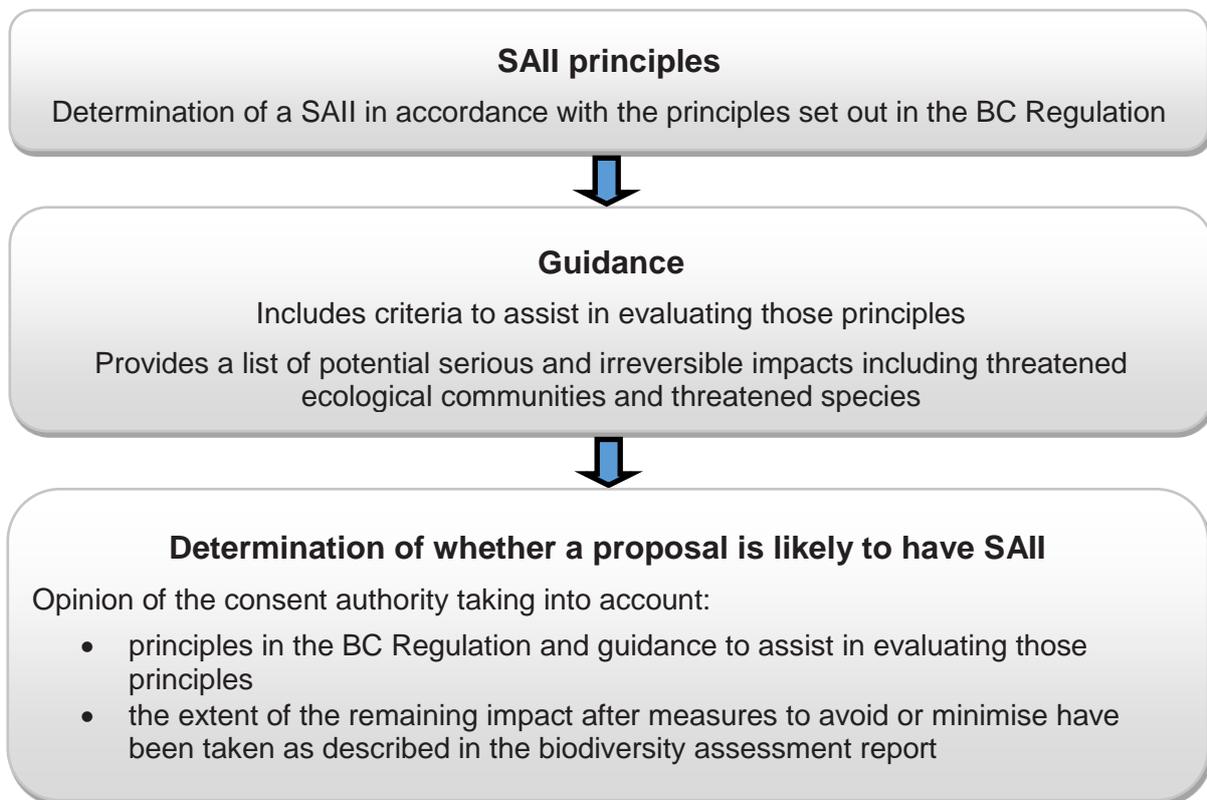


Figure 1 – Framework for determining serious and irreversible impacts on biodiversity values

### 3.3 Determining whether impacts are serious and irreversible

In determining whether or not impacts on candidate species will be serious and irreversible, the decision maker should consider:

#### Principle 1

- a. Does the proposal impact on a species, population or ecological community that is a candidate entity because it is in a rapid rate of decline?
- b. If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? **Note:** where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.

#### Principle 2

- a. Does the proposal impact on a species that is a candidate entity because it has been identified as having a very small population size?
- b. If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? **Note:** where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.

### Principle 3

- a. Does the proposal impact on the habitat of a species or an area of an ecological community that is a candidate entity because it has a very limited geographic distribution?
- b. If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? **Note:** where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.

### Principle 4

- a. Does the proposal impact on a species, a component of species habitat or an ecological community that is a candidate entity because it is irreplaceable?
- b. If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? **Note:** where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.

#### 3.3.1 Identifying candidate entities

The candidate entities listed under Appendix 2 or Appendix 3 are those which have been assessed considering the elements of the principles at 1(a), 2 (a), 3(a) and 4(a) and the criteria at Appendix 1.

Species or communities may be listed as a candidate entity in Appendix 2 or Appendix 3 under more than one principle. A decision maker may also determine that a species or ecological community which is not listed in Appendix 2 or 3 is a candidate entity, in accordance with the principles and criteria.

After identifying the candidate entity, the decision maker must decide whether any of the impacts of the proposal which will remain after proposed measures to avoid or minimise have been taken are likely to be a SAll under each principle relevant to the species or community. Thresholds listed for certain candidate entities are relevant considerations. Where there is no threshold listed, any impact is considered likely to be a serious and irreversible impact.

#### 3.3.2 Evaluate nature of impact on candidate entity

After a candidate entity has been identified as being impacted by a proposal, the decision maker should evaluate the impacts on the entity to determine whether they are likely to be serious and irreversible. To do this, the decision-maker should consider the elements of the principles at 1(b), 2(b), 3(b) and 4(b) relevant to the species or community. In evaluating the impacts, the consent authority should also consider relevant aspects of the criteria at Appendix 1.

In making this decision, the decision maker will have the following information to consider in the Biodiversity Development Assessment Report or Biodiversity Certification Assessment Report – collectively Biodiversity Assessment Report (BAR) – in relation to the impacts of the proposed development:

#### **Does the Biodiversity Assessment Report indicate that the proposal impacts on a candidate entity?**

The application of Stage 1 – Biodiversity Assessment of the Biodiversity Assessment Method (BAM) by an accredited assessor will identify if the land contains a candidate entity or habitat for a candidate entity listed in Appendix 2 or Appendix 3 of this guidance. The

accredited assessor is required to identify the area and location of the entity in the BAR. This information may be used by the proponent at this stage to avoid any impact on the candidate species or ecological community.

### **Does the Biodiversity Assessment Report set out the measures taken to avoid or minimise the impact?**

The BAR is required to set out the measures that the proponent of the proposed development, activity or clearing proposes to take to avoid or minimise the impact. These measures must be considered by the consent authority in determining whether an impact is acceptable.

### **The extent of the impact as described in the Biodiversity Assessment Report**

Application of *Stage 2 – Impact assessment* of the BAM sets out specific impact assessment provisions that must be addressed by the assessor when preparing the BAR for a proposal that will impact on a candidate entity. These provisions are set out in Section 9.2 of the draft BAM.

This provides the consent authority with information that describes the extent to which a proposal will impact on a threatened entity.

### **Does the impact exceed the impacts threshold for the entity?**

Entities in the candidate list may have an impact threshold identified. Impacts on the candidate entity below this threshold are unlikely to result in a SAIL. It is expected that some candidate entities will not specify an impact threshold.

Thresholds will differ between entities which reflects the principle by which the species has been identified. For example, a threatened plant species may be listed as a candidate SAIL with a threshold set at two individuals, because the species is known to only have a very small population. Where a development proposes to impact on less than three individuals, the consent authority can use this information in determining whether the proposal would result in a SAIL on the species. A threshold unit may be expressed as a number of individuals of species, an area or percentage of habitat or a specified condition of an ecological community.

The accredited assessor is required to provide information in the BAR for the consent authority to consider regarding whether the impact threshold is likely to be exceeded by the development.

### **Evaluation of an impact on a candidate species**

To assist the decision maker evaluate the extent of the impacts on a threatened species in accordance with principles, the accredited assessor is required to address the following provisions in the BAR. The impact assessment provisions assess the actual or estimated size and extent in loss in population size, habitat area, or the extent to which the habitat area of the species is modified either directly or indirectly. The BAM will also include provisions that assesses impacts on the ecology and ongoing viability of the affected population.

The impact assessment provision for threatened species include:

1. the size of the local population directly and indirectly impacted by the development and the likely impact (including direct and indirect impacts) that the development will have on the habitat of the local population, including but not limited to:

- a. an estimate of the change in habitat available to the local population as a result of the proposed development
- b. the proposed loss, modification, destruction or isolation of the available habitat used by the local population, and
- c. modification of habitat required for the maintenance of processes important to the species' life cycle (such as in the case of a plant – pollination, seed set, seed dispersal, germination), genetic diversity and long-term evolutionary development

Atlas records, NSW Scientific Determination or other documented, quantifiable means must be used by the assessor to estimate what percentage of the species' population and habitat is likely to be lost in the long term due to the direct and indirect impacts of the development

2. the likely impact on the ecology of the local population. At a minimum, address the following for fauna:
  - a. breeding
  - b. foraging
  - c. roosting, and
  - d. dispersal or movement pathways, or

for flora, address how the proposal is likely to affect the ecology and biology of any residual plant population that will remain post development including where information is available:

- a. pollination cycle
  - b. seedbanks
  - c. recruitment, and
  - d. interactions with other species (e.g. pollinators, host species, mycorrhizal associations)
3. a description of the extent to which the local population will become fragmented or isolated as a result of the proposed development
  4. the relationship of the local population to other population/populations of the species. This must include consideration of the interaction and importance of the local population to other population/populations for factors such as breeding, dispersal and genetic viability/diversity, and whether the local population is at the limit of the species' range
  5. the extent to which the proposed development will lead to an increase in threats and indirect impacts, including impacts from invasive flora and fauna, that may in turn lead to a decrease in the viability of the local population
  6. the measure/s proposed to contribute to the recovery of the species in the Interim Biogeographic Regionalisation for Australia (IBRA) subregion.

### **Evaluation of an impact on a candidate threatened ecological community**

To assist the decision-maker evaluate the extent of the impacts on a TEC in accordance with principles, the accredited assessor is required to address the following provisions in the BAR. For ecological communities, the impact assessment criteria quantifies the actual area and condition of the ecological community that is impacted directly or indirectly by the proposal compared to the extent of the community in the immediate region and the broader IBRA subregion. It also includes criteria that provides the consent authority with information that assesses abiotic factors, as well as the extent to which the proposal will lead to fragmentation or isolation of the ecological community.

The impact assessment provision for threatened ecological communities (TEC) include:

1. the area and condition of the TEC to be impacted directly and indirectly by the proposed development
2. the extent and overall condition of the TEC within an area of 1500 metres, and then 5000 metres, surrounding the proposed development footprint. In the case of strategic biodiversity certification projects, the extent and overall condition of the TEC may be assessed across the IBRA sub region
3. an estimate of the extant area and overall condition of the TEC remaining before and after the impact of the proposed development has been taken into consideration
4. the development proposal's impact on:
  - a. abiotic factors critical to the long-term survival of the TEC; for example, will the impact lead to a reduction of groundwater levels or substantial alteration of surface water patterns; will it alter natural disturbance regimes that the TEC depends upon, e.g. fire, flooding etc.?
  - b. characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of under-storey species or harvesting of plants
  - c. the quality and integrity of an occurrence of the TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the TEC
5. direct or indirect fragmentation and isolation of an area of the TEC
6. the measures proposed to contribute to the recovery of the TEC in the IBRA subregion.

## Appendix 1: Criteria for identifying candidate entities

This section sets out criteria that assist in identifying threatened species and threatened ecological communities which are likely to be candidate entities in accordance with the principles in the regulation. That is, species or ecological communities which are:

1. observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline
2. observed, estimated, inferred or reasonably suspected to have a very small population size
3. observed, inferred or estimated to have very limited geographic distribution, or
4. unlikely to respond to management and are therefore irreplaceable.

The principles in the regulation broadly align with the criteria prepared by the IUCN (2016) to assess the extinction risk of species and ecological communities.

Note that the candidate entities that have already been evaluated according to the principles and the criteria in this appendix are listed in Appendix 2 and Appendix 3. The appendices also identify the relevant principles that the candidate entity 'triggers'.

### Principle 1 – species or ecological community currently in a rapid rate of decline

Species and ecological communities that have undergone large reductions or are likely to undergo large reductions in the future are likely to be at greater risk of extinction than those that have undergone or are likely to undergo smaller reductions (NSW Scientific Committee 2014).

Candidate SAIL entities listed under this principle have already undergone, currently are in, or are projected to undergo, a rapid rate of decline. Criteria used to identify these entities include the following:

#### Entities listed as critically endangered under the BC Act

This principle would generally capture species or ecological communities that are listed as critically endangered under the BC Act.

#### Rapid rate of decline for species

The species has an observed, estimated, inferred, suspected or projected population reduction of  $\geq 80\%$  in 10 years or three generations (whichever is longer).

'Generation' is here defined as the average age of parents of the current cohort (i.e. newborn individuals in the population). Generation therefore reflects the turnover rate of breeding individuals in a population (IUCN 2001, 2016).

The period of decline can be assessed as recent decline, current decline or projected future decline which is liable to continue unless remedial measures are taken.

Different measures may be used to assess reduction in population size including an index of abundance appropriate to the species, or its geographic distribution, habitat quality or habitat diversity.

### **Rapid rate of decline for an ecological community**

To be evaluated under this principle, the ecological community should have been observed, estimated, inferred, or reasonably suspected to have undergone, or be projected to undergo, a very large reduction in distribution:

- $\geq 90\%$  reduction where the reduction is measured since 1750 (historical decline), or
- $\geq 80\%$  reduction where the reduction is over a 50-year period, either in the past, future, or any part of past, present and future.

The period of decline for an ecological community can be assessed as recent decline, current decline or projected future decline which is liable to continue unless remedial measures are taken, or alternatively, as historical decline.

## **Principle 2 – species or ecological community with a very small population size**

Species with very small populations are highly vulnerable to unforeseen or unnatural events that impact on their population size. These events could include catastrophic bushfires, drought or storm damage. Impacts from development or biodiversity certification proposals that further reduce their population size makes them highly vulnerable to extinction during the time-lag between the impacts from a development and the realisation of ecological benefits from improvements in habitat condition at a stewardship site.

### **Entities listed as critically endangered under the BC Act**

This principle would generally capture species listed as critically endangered under the BC Act because their very small population size as quantitatively determined by the NSW Scientific Committee.

### **Very small population size**

Species that are considered to have a very small population size are species with a known population size that is either:

- fewer than 50 mature individuals independent of whether there any threats, or
- less than 250 mature individuals and the species has known threats (IUCN 2001).

### **Population**

This refers to the total number of mature individuals in New South Wales (IUCN 2001, 2016). For functional reasons, primarily owing to differences between life forms, population size is measured as the number of mature individuals only. The number of mature individuals is the number of individuals known, estimated or inferred to be capable of reproduction.

Species that are known to have a very small population size based on the above criteria are shown on the list in Appendix 2. These are species that are listed as critically endangered because their very small population size has been quantitatively determined by the NSW Scientific Committee, or the best available information on the population size for the species meets the threshold in the criteria above.

## **Principle 3 – species or area of ecological community with very limited geographic distribution**

The principle is particularly important to consider given stewardship sites do not necessarily seek to establish species populations in new locations but enhance or restore the habitat area of existing ones. Similarly, there are greater risks to restore or rehabilitate ecological communities that have a very limited distribution at biodiversity stewardship sites. This is

because there are very limited opportunities to manage the community which already is at a greater risk of a single event that adversely affects the entire distribution.

Any impacts on the entities that meet this principle will likely lead to, or greatly increase the risk of, extinction should one or more of the known remaining locations be impacted on by development.

### **Entities listed as critically endangered under the BC Act**

This principle would generally capture species or ecological communities that are listed as critically endangered because their very limited geographic distribution has been determined by the NSW Scientific Committee.

#### **Very limited geographic distribution (species)**

Species that have a very limited geographic distribution are generally known to:

- inhabit less than three locations in New South Wales
- have an area of occupancy (sensu IUCN 2016) of  $\leq 10 \text{ km}^2$ , or
- have an extent of occurrence (sensu IUCN 2016) of  $\leq 100 \text{ km}^2$ .

#### *Location*

Location is defined as a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat (IUCN 2016).

Threatened species that are known to have a very limited geographic distribution are shown on the list in Appendix 2.

#### **Very limited geographic distribution (ecological community)**

The geographical distribution of ecological communities is defined by the area of occupancy (sensu Bland et al. 2016). Ecological communities with a very limited geographic distribution have an area of occupancy of  $\leq 2 \text{ } 10 \times 10 \text{ km}$  grid cells or an extent of occurrence of  $\leq 1000 \text{ km}^2$  (sensu Bland et al 2016) .

Ecological communities that are known to have a very limited geographic distribution are shown on the list in Appendix 3.

## **Principle 4 – species or ecological community that is unlikely to respond to management and is therefore irreplaceable**

The consideration of whether an entity is unlikely to respond to management encompasses two key elements. The first element is based on consideration of the best current ecological knowledge of the life history traits and characteristics of a species. There are some threatened species that are known to display particular life history traits that limits the species ability to increase in abundance at a stewardship site. For a smaller number of species, there is insufficient knowledge of the species to be able to manage it at a stewardship site.

The second element considers whether there are any key threatening process affecting the species or ecological community that cannot be effectively managed by a landowner at a stewardship site.

Species that meet this principle may be listed as critically endangered, endangered or vulnerable under the BC Act or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

**Species or ecological community that cannot be offset because the entity is unlikely to respond to management**

These are species or ecological communities with:

1. life history traits and/or ecology which is known, but the ability to control key threats at the site-scale is negligible (e.g. uncontrollable disease, break-down of a species social structure due to population decline)
2. known reproductive characteristics that severely limit their ability to increase the existing population on, or occupy new habitat at, a stewardship site. These are plants that are sterile or largely clonal with no or very limited capacity to increase number through seed production and recruitment (e.g. *Zieria baeuerlenii* and *Hakea pulvinifera*)
3. ecology that is very poorly known, rendering it difficult to determine effective management actions and/or anticipate the likely response of the species to management applied at the site scale.

**Irreplaceable**

The consideration of whether an impact on an entity is irreplaceable takes into account two factors. The first factor is the likely success in achieving gain in condition, abundance or habitat area at a biodiversity stewardship site. For candidate species that are identified in the criteria 1–3 above, the likelihood of achieving an offset gain is extremely low or highly uncertain.

The second factor takes into account consideration of impacts on habitat components that cannot readily be re-created at an offset site. This includes impacts on breeding habitat such as caves or cliff lines that are used by threatened species.

## Appendix 2: List of candidate species (and their habitat) that meet the SAI principles and criteria

Any threatened species, ecological community or habitat component of a threatened species or ecological community not listed in Appendix 2 or Appendix 3 is unlikely to meet the relevant SAI principles. However, a decision maker may still consider whether a species or ecological community is likely to meet the relevant SAI principles.

### Table A-1: Threatened species that are candidates for serious and irreversible impacts (thresholds TBC)

#### Caveats

The list is indicative only. It is based on the priority 320 species for which data has been reviewed for exhibition. This list encompasses most of those species likely to meet principles 1 to 3; however, a subset of the remaining threatened species will need to be reviewed to determine if they meet principle 4. Note also that all threatened species data is subject to ongoing review.

#### Thresholds

A subset of species listed on the SAI schedule, including broad-ranging species, will have thresholds below which the species will not be a SAI. For example, swift parrots are Critically Endangered and, therefore, impacts on their habitat will be considered a SAI. Given these are broad-ranging species with potential habitat across a large area, thresholds will be set so that only habitat considered important for the species will be a SAI. 'Important habitat' could be defined as sites with multiple records of the species over a period of five or more years and/or that have been identified as breeding habitat (evidence-based). These areas could be mapped. Similarly, a SAI threshold for the Critically Endangered (EPBC Act) plains-wanderer could be 'primary habitat' as mapped in the draft recovery plan. Any impact on non-primary habitat would not be considered a SAI and offset accordingly.

Thresholds are yet to be developed.

Draft guidance and criteria to assist a determining authority determine a serious and irreversible impact

Species (scientific name)	Species (common name)	Principle				Justification	Reference
		1	2	3	4		
<i>Amytornis textilis modestus</i>	Thick-billed grasswren (eastern subspecies)		√	√	√	Data from listing determination; ecology or response to management is poorly known	<u>Final Determination</u>
<i>Anomalopus mackayi</i>	Five-clawed worm-skink				√	Ecology or response to management is poorly known	Principle 4 on account of data from threatened species module of BioNet
<i>Anthochaera phrygia</i>	Regent honeyeater	√				Data from listing determination	<u>Final Determination</u>
<i>Astrotricha crassifolia</i>	Thick-leaf star-hair		√	√	√	Number of mature individuals is very low. Geographic distribution is very highly restricted. Reproductive strategy severely limits recruitment – sterile or primarily clonal	Principle 4 on account of data from threatened species module of BioNet
<i>Austrostipa metatoris</i>	A spear-grass				√	Ecology or response to management is poorly known	Principle 4 on account of data from threatened species module of BioNet
<i>Banksia conferta</i> subsp. <i>Conferta</i>	Banksia conferta subsp. Conferta			√		Data from listing determination	<u>Final Determination</u>
<i>Banksia vincentia</i>	Banksia vincentia	√	√	√		Data from listing determination New South Wales and Commonwealth	<u>Final Determination</u> Proposed listing EPBC Act
<i>Bossiaea fragrans</i>	Bossiaea fragrans		√	√		Data from listing determination	<u>Final Determination</u>
<i>Caladenia arenaria</i>	Sand-hill spider orchid		√	√	√	Number of mature individuals is extremely low. Geographic distribution is very highly restricted. Species dependent on non-responding attribute	Principle 4 on account of data from threatened species module of BioNet
<i>Caladenia attenuata</i>	Duramana fingers		√	√	√	Data from listing determination; ecology or response to management is poorly known	<u>Final Determination</u>
<i>Caladenia concolor</i>	Crimson spider orchid		√	√	√	Number of mature individuals is extremely low. Geographic distribution is very highly restricted. Species dependent on non-responding attribute	Principle 4 on account of data from threatened species module of BioNet

Draft guidance and criteria to assist a determining authority determine a serious and irreversible impact

Species (scientific name)	Species (common name)	Principle				Justification	Reference
		1	2	3	4		
<i>Caladenia montana</i>	Caladenia montana				√	Species dependent on non-responding attribute	Principle 4 on account of data from threatened species module of BioNet
<i>Calochilus pulchellus</i>	Pretty beard orchid		√	√	√	Number of mature individuals is extremely low. Geographic distribution is very highly restricted. Species dependent on non-responding attribute	Principle 4 on account of data from threatened species module of BioNet
<i>Callistemon megalongensis</i>	Megalong Valley bottlebrush			√		Data from listing determination	<u>Final Determination</u>
<i>Calyptorhynchus banksii banksii</i>	Red-tailed black-cockatoo (coastal subspecies)	√	√		√	Data from listing determination; threats beyond control (almost certainly extinct in New South Wales)	<u>Final Determination</u>
<i>Cryptostylis hunteriana</i>	Leafless tongue orchid				√	Species dependent on non-responding attribute	Principle 4 on account of data from threatened species module of BioNet
<i>Cyclopsitta diophthalma coxeni</i>	Coxen's fig-parrot	√	√		√	Data from listing determination; ecology or response to management is poorly known	<u>Final Determination</u>
<i>Daphnandra johnsonii</i>	Illawarra socketwood				√	Threats beyond control; reproductive strategy severely limits recruitment – sterile or primarily clonal	Principle 4 on account of data from threatened species module of BioNet
<i>Diuris arenaria</i>	Sand doubletail			√	√	Geographic distribution is very highly restricted. Species dependent on non-responding attribute	Principle 4 on account of data from threatened species module of BioNet
<i>Diuris eborensis</i>	Diuris eborensis				√	Species dependent on non-responding attribute	Principle 4 on account of data from threatened species module of BioNet
<i>Diuris flavescens</i>	Pale yellow doubletail		√	√	√	Data from listing determination; species dependent on non-responding attribute	<u>Final Determination</u>

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Species (scientific name)	Species (common name)	Principle				Justification	Reference
		1	2	3	4		
<i>Diuris pedunculata</i>	Small snake orchid				√	Species dependent on non-responding attribute	Principle 4 on account of data from threatened species module of BioNet
<i>Diuris praecox</i>	Rough doubletail				√	Species dependent on non-responding attribute	Principle 4 on account of data from threatened species module of BioNet
<i>Dodonaea procumbens</i>	Creeping hop-bush				√	Species dependent on non-responding attribute	Principle 4 on account of data from threatened species module of BioNet
<i>Dodonaea stenozyga</i>	Desert hopbush		√	√		Data from listing determination	<u>Final Determination</u>
<i>Eleocharis obicis</i>	Spike-rush				√	Ecology or response to management is poorly known	Principle 4 on account of data from threatened species module of BioNet
<i>Erythrorichis radiatus</i>	Red goshawk	√	√		√	Data from listing determination; ecology or response to management is poorly known	<u>Final Determination</u>
<i>Esacus magnirostris</i>	Beach stone-curlew		√			Data from listing determination	<u>Final Determination</u>
<i>Eucalyptus recurva</i>	Mongarlowe mallee	√	√	√	√	Data from listing determination; reproductive strategy severely limits recruitment – sterile or primarily clonal	<u>Final Determination</u>
<i>Eucalyptus sp. Cattai</i>	Eucalyptus sp. Cattai		√			Data from listing determination	<u>Final Determination</u>
<i>Euphrasia arguta</i>	Euphrasia arguta			√		Data from listing determination	<u>Final Determination</u>
<i>Fontainea oraria</i>	Coastal fontainea		√	√		Data from listing determination	<u>Final Determination</u>
<i>Genoplesium baueri</i>	Bauer's midge orchid		√		√	Number of mature individuals is very low. Species dependent on non-responding attribute	Principle 4 on account of data from threatened species module of BioNet

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Species (scientific name)	Species (common name)	Principle				Justification	Reference
		1	2	3	4		
<i>Genoplesium insigne</i>	Variable midge orchid		√	√	√	Number of mature individuals is very low. Geographic distribution is very highly restricted. Reproductive strategy severely limits recruitment – sterile or primarily clonal	<u>Final Determination</u>
<i>Genoplesium littorale</i>	Tuncurry midge orchid			√	√	Data from listing determination; species dependent on non-responding attribute	<u>Final Determination</u>
<i>Genoplesium plumosum</i>	Tallong midge orchid			√		Data from listing determination	<u>Final Determination</u>
<i>Gentiana bredboensis</i>	Bredbo gentian		√			Data from listing determination	<u>Final Determination</u>
<i>Gentiana wingecarribiensis</i>	Wingecarribee gentian	√	√	√	√	Data from listing determination; reproductive strategy severely limits recruitment – sterile or primarily clonal	<u>Final Determination</u>
<i>Grevillea caleyi</i>	Caley's grevillea			√		Data from listing determination; species dependent on non-responding attribute	<u>Final Determination</u>
<i>Grevillea divaricata</i>	Grevillea divaricata		√	√	√	Number of mature individuals is extremely low. Geographic distribution is very highly restricted. Ecology or response to management is poorly known	
<i>Grevillea iaspicula</i>	Wee jasper grevillea		√	√		Data from listing determination	<u>Final Determination</u>
<i>Grevillea parviflora</i> <i>subsp. Parviflora</i>	Small-flower grevillea				√	Ecology or response to management is poorly known	Principle 4 on account of data from threatened species module of BioNet
<i>Hakea pulvinifera</i>	Lake Keepit hakea		√	√	√	Number of mature individuals is extremely low. Geographic distribution is very highly restricted. Reproductive strategy severely limits recruitment – sterile or primarily clonal	Principle 4 on account of data from threatened species module of BioNet
<i>Hibbertia spanantha</i>	Julian's hibbertia		√	√		Data from listing determination	<u>Final Determination</u>

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Species (scientific name)	Species (common name)	Principle				Justification	Reference
		1	2	3	4		
<i>Hibbertia sp. Bankstown</i>	Hibbertia sp. Bankstown		√	√		Data from listing determination	<a href="#">Final Determination</a>
<i>Jalmenus eubulus</i>	Pale imperial hairstreak	√	√	√		Data from listing determination; ecology or response to management is poorly known	<a href="#">Final Determination</a>
<i>Lasiopetalum behrii</i>	Pink velvet bush		√	√	√	Data from listing determination; ecology or response to management is poorly known	<a href="#">Final Determination</a>
<i>Lathamus discolor</i>	Swift parrot	√				Data from listing determination	<a href="#">Final Determination</a>
<i>Litoria castanea</i>	Yellow-spotted tree frog	√	√		√	Data from listing determination; threats beyond control (key threat chytrid fungus)	<a href="#">Final Determination</a>
<i>Litoria piperata</i>	Peppered tree frog	√	√		√	Data from listing determination; ecology or response to management is poorly known	<a href="#">Final Determination</a>
<i>Litoria spenceri</i>	Spotted tree frog	√	√		√	Data from listing determination; threats beyond control (key threat chytrid fungus)	<a href="#">Final Determination</a>
<i>Manorina melanotis</i>	Black-eared miner	√	√	√		Data from listing determination	<a href="#">Final Determination</a>
<i>Mixophyes balbus</i>	Stuttering frog				√	Threats beyond control (key threat chytrid fungus)	Principle 4 on account of data from threatened species module of BioNet
<i>Mormopterus eleryi</i>	Bristle-faced free-tailed bat, hairy-nosed freetail bat				√	Ecology or response to management is poorly known	Principle 4 on account of data from threatened species module of BioNet
<i>Myriophyllum implicatum</i>	Myriophyllum implicatum		√	√	√	Data from listing determination; species dependent on non-responding attribute	<a href="#">Final Determination</a>
<i>Neophema chrysogaster</i>	Orange-bellied parrot	√	√			Data from listing determination	<a href="#">Final Determination</a>
<i>Ozothamnus tessellatus</i>	Ozothamnus tessellatus				√	Ecology or response to management is poorly known	Principle 4 on account of data from threatened species module of BioNet

Draft guidance and criteria to assist a determining authority determine a serious and irreversible impact

Species (scientific name)	Species (common name)	Principle				Justification	Reference
		1	2	3	4		
<i>Pachycephala rufogularis</i>	Red-lored whistler		√			Data from listing determination	<a href="#">Final Determination</a>
<i>Pedionomus torquatus</i>	Plains-wanderer	√				Data from listing determination	<a href="#">Final Determination</a>
<i>Persoonia pauciflora</i>	North Rothbury persoonia	√		√		Data from listing determination	<a href="#">Final Determination</a>
<i>Petrogale penicillata</i>	Brush-tailed rock-wallaby				√	Species dependent on non-responding attribute (rocky habitat)	Principle 4 on account of data from threatened species module of BioNet
<i>Pimelea venosa</i>	Bolivia Hill pimelea		√	√	√	Number of mature individuals is extremely low. Geographic distribution is very highly restricted. Ecology or response to management is poorly known	Principle 4 on account of data from threatened species module of BioNet
<i>Pomaderris delicata</i>	Delicate pomaderris		√	√		Data from listing determination	<a href="#">Final Determination</a>
<i>Pomaderris reperta</i>	Denman pomaderris			√		Data from listing determination	<a href="#">Final Determination</a>
<i>Pomaderris walshii</i>	Carrington Falls pomaderris		√	√		Data from listing determination	<a href="#">Final Determination</a>
<i>Prasophyllum bagoense</i>	Prasophyllum bagoense		√	√	√	Data from listing determination; species dependent on non-responding attribute	<a href="#">Final Determination</a>
<i>Prasophyllum canaliculatum</i>	Summer leek orchid		√	√	√	Data from listing determination; species dependent on non-responding attribute	<a href="#">Final Determination</a>
<i>Prasophyllum fuscum</i>	Slaty leek orchid		√	√	√	Data from listing determination; species dependent on non-responding attribute	<a href="#">Final Determination</a>
<i>Prasophyllum innubum</i>	Prasophyllum innubum			√	√	Data from listing determination; species dependent on non-responding attribute	<a href="#">Final Determination</a>
<i>Prasophyllum keltonii</i>	Kelton's leek orchid			√	√	Data from listing determination; species dependent on non-responding attribute	<a href="#">Final Determination</a>

Draft guidance and criteria to assist a determining authority determine a serious and irreversible impact

Species (scientific name)	Species (common name)	Principle				Justification	Reference
		1	2	3	4		
<i>Prasophyllum pallens</i>	Musty leek orchid			√	√	Geographic distribution is very highly restricted. Species dependent on non-responding attribute	
<i>Prasophyllum sp. Majors Creek</i>	Majors Creek leek orchid	√	√	√	√	Data from listing determination; ecology or response to management is poorly known	<u>Final Determination</u>
<i>Prasophyllum sp. Moama</i>	Prasophyllum sp. Moama			√	√	Data from listing determination; species dependent on non-responding attribute	<u>Final Determination</u>
<i>Pseudomys fumeus</i>	Smoky mouse	√				Data from listing determination	<u>Final Determination</u>
<i>Pseudomys desertor</i>	Desert mouse		√		√	Data from listing determination; ecology or response to management is poorly known	<u>Final Determination</u>
<i>Pseudophryne corroboree</i>	Southern corroboree frog	√		√	√	Data from listing determination; threats beyond control (key threat chytrid fungus)	<u>Final Determination</u>
<i>Pseudophryne pengilleyi</i>	Northern corroboree frog	√				Data from listing determination	<u>Final Determination</u>
<i>Pterostylis alpina</i>	Pterostylis alpina				√	Reproductive strategy severely limits recruitment – sterile or primarily clonal	Principle 4 on account of data from threatened species module of BioNet
<i>Pterostylis chaetophora</i>	Pterostylis chaetophora				√	Species dependent on non-responding attribute	
<i>Pterostylis despectans</i>	Pterostylis despectans		√	√	√	Data from listing determination; species dependent on non-responding attribute	<u>Final Determination</u>
<i>Pterostylis gibbosa</i>	Illawarra greenhood				√	Species dependent on non-responding attribute	Principle 4 on account of data from threatened species module of BioNet
<i>Pterostylis oreophila</i>	Blue-tongued greenhood		√	√	√	Data from listing determination; ecology or response to management is poorly known	<u>Final Determination</u>

Draft guidance and criteria to assist a determining authority determine a serious and irreversible impact

Species (scientific name)	Species (common name)	Principle				Justification	Reference
		1	2	3	4		
<i>Pterostylis ventricosa</i>	Pterostylis ventricosa			√	√	Data from listing determination; species dependent on non-responding attribute	<a href="#">Final Determination</a>
<i>Pterostylis vernalis</i>	Pterostylis vernalis			√	√	Data from listing determination; species dependent on non-responding attribute	<a href="#">Final Determination</a>
<i>Pultenaea elusa</i>	Elusive bush-pea	√	√	√	√	Data from listing determination; species dependent on non-responding attribute	<a href="#">Final Determination</a>
<i>Pultenaea sp. Genowlan Point</i>	Pultenaea sp. Genowlan point		√	√		Data from listing determination	<a href="#">Final Determination</a>
<i>Pultenaea sp. Olinda</i>	Pultenaea sp. Olinda		√		√	Number of mature individuals is very low. Ecology or response to management is poorly known	Principle 4 on account of data from threatened species module of BioNet
<i>Rhizanthella slateri</i>	Eastern australian underground orchid		√		√	Number of mature individuals is very low. Species dependent on non-responding attribute	Principle 4 on account of data from threatened species module of BioNet
<i>Suta flagellum</i>	Little whip snake				√	Ecology or response to management is poorly known	Principle 4 on account of data from threatened species module of BioNet
<i>Synemon plana</i>	Golden sun moth				√	Data from listing determination	<a href="#">Final Determination</a>
<i>Thelymitra adorata</i>	Wyong sun orchid		√	√	√	Data from listing determination; species dependent on non-responding attribute	<a href="#">Final Determination</a>
<i>Thelymitra atronitida</i>	Black-hooded sun orchid	√	√	√		Data from listing determination	<a href="#">Final Determination</a>
<i>Thelymitra kangaloonica</i>	Kangaloon sun orchid		√	√	√	Data from listing determination; species dependent on non-responding attribute	<a href="#">Final Determination</a>
<i>Thinornis rubricollis</i>	Hooded plover	√	√			Data from listing determination	<a href="#">Final Determination</a>
<i>Turnix maculosus</i>	Red-backed button-quail				√	Ecology or response to management is poorly known	Principle 4 on account of data from threatened species module of BioNet

Draft guidance and criteria to assist a determining authority determine a serious and irreversible impact

Species (scientific name)	Species (common name)	Principle				Justification	Reference
		1	2	3	4		
<i>Turnix melanogaster</i>	Black-breasted button-quail	√			√	Data from listing determination; ecology or response to management is poorly known	<a href="#">Final Determination</a>
<i>Zieria adenophora</i>	Araluen zieria		√	√		Data from listing determination	<a href="#">Final Determination</a>
<i>Zieria baeuerlenii</i>	Bomaderry zieria				√	Reproductive strategy severely limits recruitment – sterile or primarily clonal	Principle 4 on account of data from threatened species module of BioNet
<i>Zieria buxijugum</i>	Box range zieria	√	√	√		Data from listing determination	<a href="#">Final Determination</a>
<i>Zieria formosa</i>	Shapely zieria		√	√		Data from listing determination	<a href="#">Final Determination</a>
<i>Zieria parrisiae</i>	Parris' zieria		√	√		Data from listing determination	<a href="#">Final Determination</a>

## Appendix 3: List of candidate ecological communities that meet the SAI principles and criteria

**Table B-1: BC Act listed ecological communities that are candidates for serious and irreversible impacts (thresholds TBC)**

### Caveats

The list is indicative only. It includes all listed critically endangered ecological communities; however, there may be a subset of other threatened endangered ecological communities that also meet the criteria for inclusion on this list.

### Thresholds

A subset of ecological communities listed on the SAI schedule will have thresholds below which the species will not be a SAI. For example, some ecological communities may have a threshold relating to patch size or vegetation condition, below which impacts would not be considered a SAI.

Thresholds are yet to be developed.

Ecological communities		Principle			
		1	2	3	4
Agnes Banks Woodland in the Sydney Basin Bioregion	Western Sydney		√	√	
Artesian Springs Ecological Community in the Great Artesian Basin	Murray Darling		√		√
Blue Gum High Forest in the Sydney Basin Bioregion	Sydney North Shore	√	√	√	
Cumberland Plain Woodland in the Sydney Basin Bioregion	Western Sydney	√			
Elderslie Banksia Scrub Forest in the SBB	Western Sydney		√	√	
Gnarled Mossy Cloud Forest on Lord Howe Island	Lord Howe Island			√	√
Hygrocybeae community of Lane Cove Bushland Park in the Sydney Basin Bioregion	Sydney Lane Cove		√	√	√

Ecological communities		Principle			
		1	2	3	4
Kincumber Scribbly Gum Forest in the Sydney Basin Bioregion	Central Coast (Gosford area)	√		√	
Lagunaria Swamp Forest on Lord Howe Island	Lord Howe Island	√	√	√	
Mallee and Mallee Broombush dominated woodland and shrubland lacking Triodia in the NSW South Western Slopes Bioregion	Central West Slopes (Temora-West Wyalong)		√		
Marsh Club-rush Sedgeland on the Darling Riverine Plains Bioregion	Gwydir wetlands	√	√	√	
New England Peppermint ( <i>Eucalyptus nova-anglica</i> ) Woodland on Basalts and Sediments in the New England Tableland Bioregion	New England Tablelands	√	√		
Porcupine grass – red mallee – gum coolabah hummock grassland/low sparse woodland in the Broken Hill Complex Bioregion	Broken Hill			√	
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	Western Sydney	√	√		
Sun Valley Cabbage Gum Forest in the Sydney Basin Bioregion	Lower Blue Mountains		√	√	
Windswept Feldmark in the Australian Alps Bioregion	Kosciusko National Park			√	
Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion	Eastern Sydney	√		√	
Robertson Basalt Tall Open-forest in the Sydney Basin and South Eastern Highlands Bioregions	Southern Highlands	√			