Expected survival of listed threatened species and ecological communities

Report card supplementing the NSW biodiversity indicator outlook report 2024

Department of Climate Change, Energy, the Environment and Water

NSW GOVERNMENT

Acknowledgement of Country

Department of Climate Change, Energy, the Environment and Water acknowledges the Traditional Custodians of the lands where we work and live.

We pay our respects to Elders past, present and emerging.

This resource may contain images or names of deceased persons in photographs or historical content.

Cover photo: Eastern ground parrot, Beowa National Park. Lachlan Hall/DCCEEW. **p.1:** Brush-tailed rock-wallaby, Oxley Wild Rivers National Park. Piers Thomas/DCCEEW; **p.2:** Greater glider. Pavel German/DCCEEW; **p.3:** Satellite tracking, Sturt National Park. Bobby Jo Vial/DCCEEW; **p.6:** Gang-gang cockatoo. Lachlan Copeland/DCCEEW; **p.8:** Predator-proof fence, Mallee Cliffs National Park. Wayne Lawler/AWC; **p. 11:** Coolibah-Black Box threatened ecological community. Nicola Brookhouse/DCCEEW; **p. 13:** Wollemi pine specimen and fossil. Jaime Plaza/Botanic Gardens Trust; **p.14:** Waratah, Lockleys Pylon walking track. Dilshara Hill/DCCEEW; **p.16:** Dragonfly. Rosie Nicolai/DCCEEW; **p.17:** Ant. Rosie Nicolai/DCCEEW.

Artist and designer Nikita Ridgeway from Aboriginal design agency Boss Lady Creative Designs created the People and Community symbol.

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Environment and Heritage , Department of Climate Change, Energy, the Environment and Water
Locked Bag 5022, Parramatta NSW 2124
Phone: +61 2 9995 5000 (switchboard)
Phone: 1300 361 967 (Environment and Heritage enquiries)
TTY users: phone 133 677, then ask for 1300 361 967
Speak and listen users: phone 1300 555 727, then ask for 1300 361 967
Email info@environment.nsw.gov.au
Website www.environment.nsw.gov.au

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An **indicator** is a numerical value that gives insight into the current state, or a change in state, of biodiversity or ecological integrity.

About this report card

This report card presents detailed results for the **expected survival of listed threatened species and ecological communities** indicator family, supplementing the *NSW biodiversity outlook report 2024*.

The NSW Biodiversity Indicator Program

The Biodiversity Indicator Program reports on the state and trends of biodiversity and ecological integrity in New South Wales. We have developed a framework of indicators to understand the current state of biodiversity and how it is changing over time.

The indicator framework uses the best available science for measuring biodiversity and ecological integrity. It reflects how we manage our landscapes and protect natural areas. The framework is arranged hierarchically by class, theme and family (Figure 1).

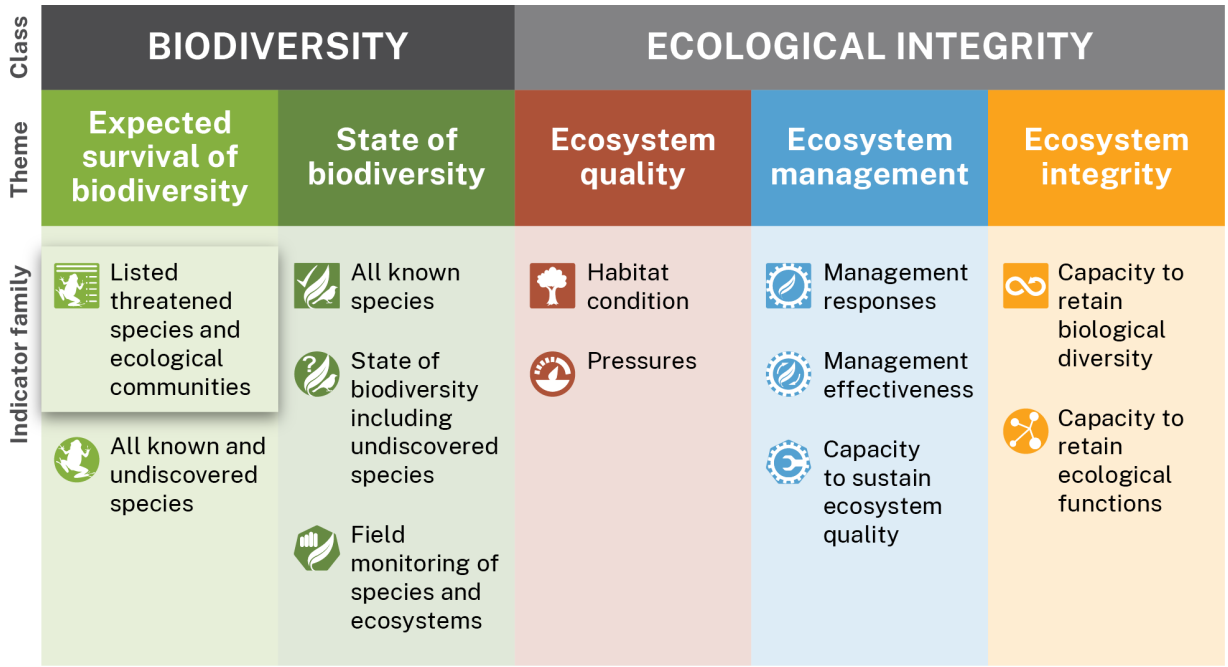


Figure 1 Hierarchy of classes, themes and indicator families in the NSW Biodiversity Indicator Program. The expected survival of listed threatened species and ecological communities indicator family is highlighted

Expected survival of listed threatened species and ecological communities

This report card presents the results for 3 indicators in the **expected survival of listed threatened species and ecological communities** indicator family (Figure 1): **listed threatened species**, **listed threatened ecological communities** and **phylogenetic diversity**. These indicators report on the likely long-term survival of species and ecological communities that have been formally assessed for risk of extinction and listed as threatened or extinct in New South Wales. The indicator family also measures the risk of losing evolutionary heritage (phylogenetic diversity).

Indicator results

Key results are presented as infographics for selected years (example shown in Figure 2). Each result is reported as a percentage along a scale from 0% to 100%. The level of confidence in the result is also shown.

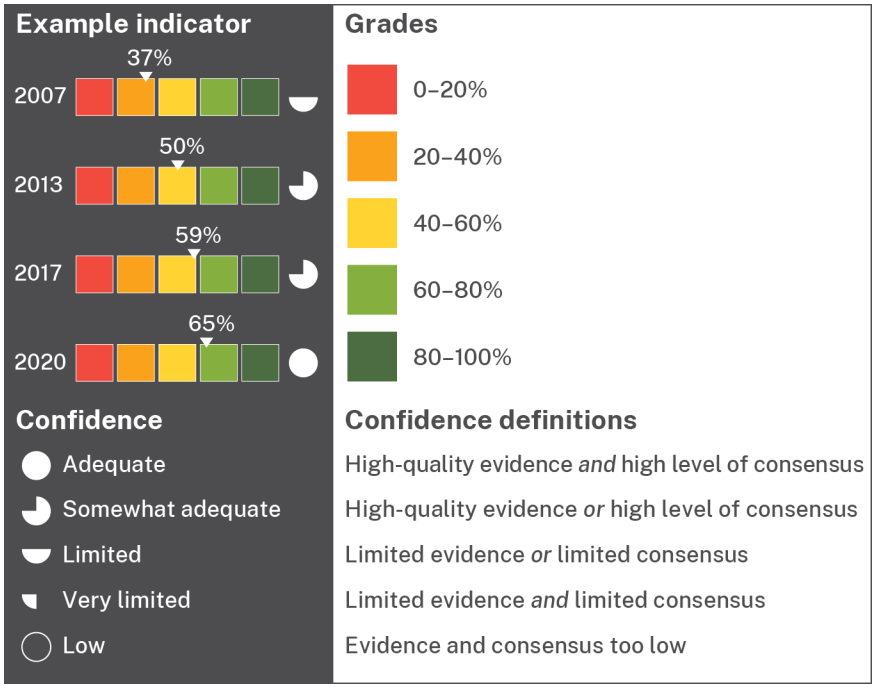


Figure 2 An example of a summary infographic for an indicator (on the left), with an explanation of terms and symbols (on the right)

Indicators are continually improved

Results may differ between reports due to improvements in science and data.

The Biodiversity Indicator Program is committed to continually improving indicators. This report card is a standalone document which builds upon previous work. Previously published values have been updated in this report card where methods and data have been improved.

Indicators use the best available data at the time of the analysis. There can be lags between when changes in the state of biodiversity happen, when data become available for analysis, and when we publish results.

Key insights

The indicators for the family **expected survival of listed threatened species and ecological communities** were assessed for 2012, 2017, 2020 and 2022.

In 2022, half of NSW listed threatened species were expected to survive in 100 years.

In 2022, 528 (50%) of 1,050 species listed as threatened in New South Wales were expected to survive in 100 years.

The number of listed threatened species expected to survive in 100 years is declining. Conservation efforts can change this trend.

Since 2012, the percentage of listed threatened species expected to survive in 100 years has declined from 52% to 50%. In 2022, 43% of threatened species are expected to potentially be lost if current threats continue without effective management. A range of programs are in place to alleviate this potential loss by addressing current threats.

In 2022, over half of listed threatened ecological communities in New South Wales were expected to exist in 100 years. This indicator has remained steady since 1997.

In 2022, 62 (55%) of 111 ecological communities listed as threatened in New South Wales were expected to survive in 100 years. Since 2012, the percentage has remained steady at 55%. This may be due to limited information rather than no change in risk of collapse.

Phylogenetic diversity is expected to decline over the next 100 years. Prioritising conservation efforts can reduce further loss.

Loss of threatened species in the next 100 years will also result in loss of phylogenetic diversity. Prioritising conservation efforts towards species that are both evolutionarily distinctive and highly threatened will significantly reduce the risk of losing irreplaceable evolutionary heritage.

Listed threatened species and ecological communities

The **expected survival of listed threatened species** indicator reports the number and percentage of species formally listed as threatened in New South Wales that are expected to survive in 100 years. Also reported is the number and percentage of listed species that will potentially be lost in 100 years and those that are already extinct in New South Wales.

The **expected existence of listed threatened ecological communities** indicator reports the number and percentage of ecological communities formally listed as threatened in New South Wales that are expected to persist in 100 years. Also reported is the number and percentage of listed ecological communities that will potentially collapse in 100 years.

The **expected survival of phylogenetic diversity for listed threatened species** indicator reports the percentage of the evolutionary tree that is expected to persist in 100 years. Also reported is the percentage of the tree that will potentially be lost in 100 years and the percentage already lost in New South Wales. This indicator is reported for selected biological groups with well-known evolutionary relationships.

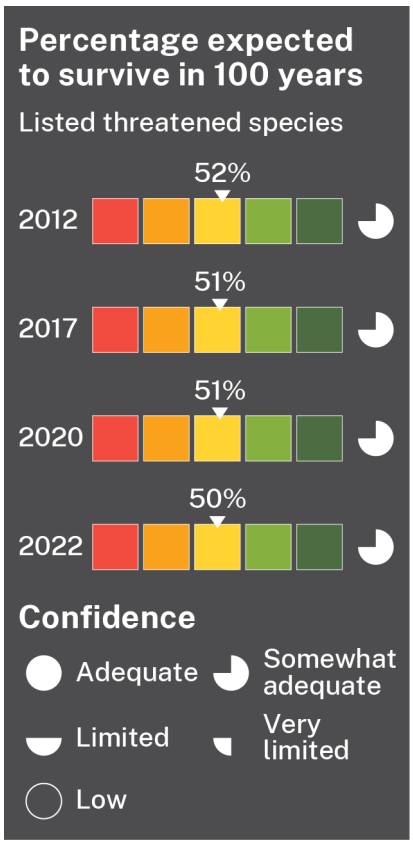
Expected survival is a measure of the potential persistence or loss of biodiversity into the future.

The count or percentage of species or ecological communities likely to persist is a useful indicator of the security of biodiversity into the future. Many species and ecological communities are at risk of being lost due to threats such as habitat loss, introduced species and climate change. Efforts to address these threats can reduce the risk of losing species or ecological communities, resulting in an improvement in the indicator.

Listed threatened species

In 2022, half of NSW listed threatened species were expected to survive in 100 years.

By the end of 2022, there were 1,050 species that were either listed as being threatened or extinct, or with listed threatened subspecies or populations, under the *Biodiversity Conservation Act 2016* (Box 1). Of these, 528 (50%) were expected to survive in 100 years, 455 (43%) could potentially become extinct within 100 years and 67 (7%) are already extinct in New South Wales (Figure 3).



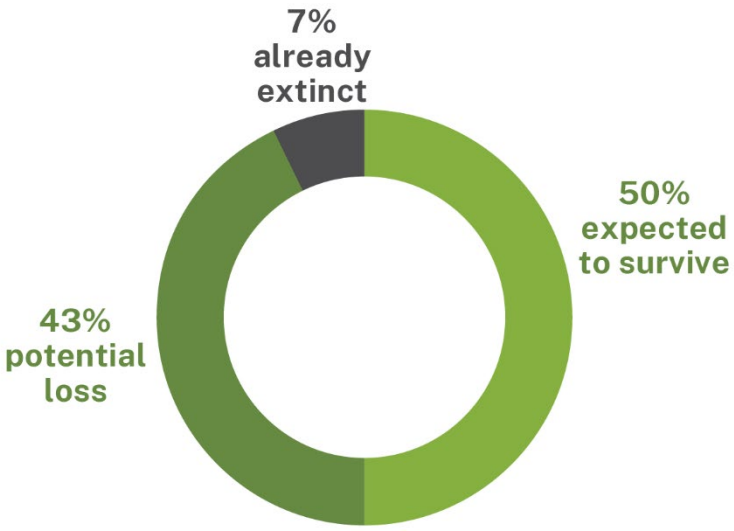


Figure 3 Percentage of listed threatened species (in 2022) which are expected to survive in 100 years, or will potentially be lost in 100 years, or which are already extinct

The chance of a species surviving in 100 years was estimated from the threatened category in which they were listed (Box 1). Species presumed to be extinct in New South Wales are likely to be truly extinct, but they are included in the count of listed species because there is a small chance that one or more will be discovered to still be alive in 100 years. More than half of the species listed as extinct in New South Wales still occur in other states and could potentially be reintroduced, thus reducing the component that is 'already extinct'.

Most species listed as threatened are from well-known biological groups.

The vast majority (96%) of listed species belong to the well-known tetrapods (birds, mammals, reptiles, frogs) and vascular plants (ferns, cycads, pines and flowering plants) and so patterns in these groups dominate the indicator (Figure 4). Other biological groups, such as insects, fungi and mosses, have historically seen much less attention for conservation assessments. The number of species at risk of extinction in these groups is therefore very poorly understood and is very likely underestimated.

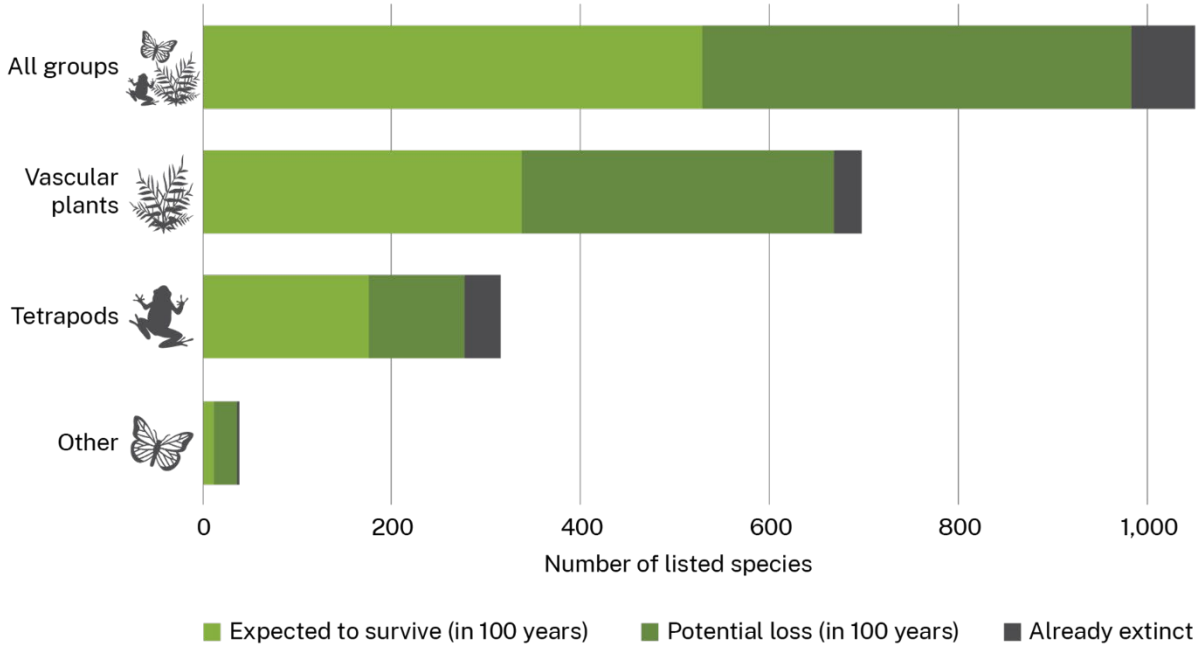


Figure 4 Number of listed species (in 2022) which are expected to survive in 100 years, or will potentially lost in 100 years or which are already extinct from different biological groups and all groups combined

The number of listed threatened species expected to survive in 100 years is declining.

The number of listed threatened species expected to survive in 100 years has declined from 548 (52%) in 2012 to 528 (50%) in 2022. The historical trend (Figure 5) assumes that each species has stayed in the same threatened category over time, except where a more recent assessment had determined a threatened species to be in a different category (due to a recovery or decline). Because species were assumed to be in the same category before they were listed, the historical trend is not due to simple growth in the number of species listed over time.

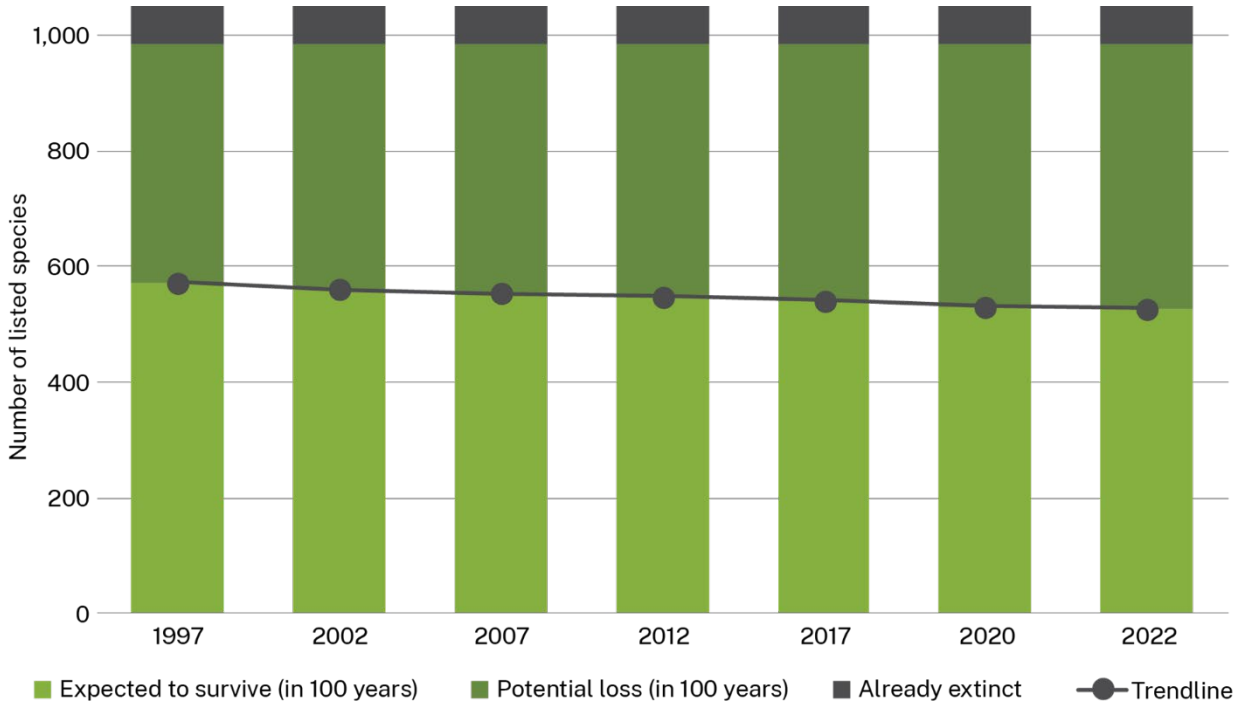
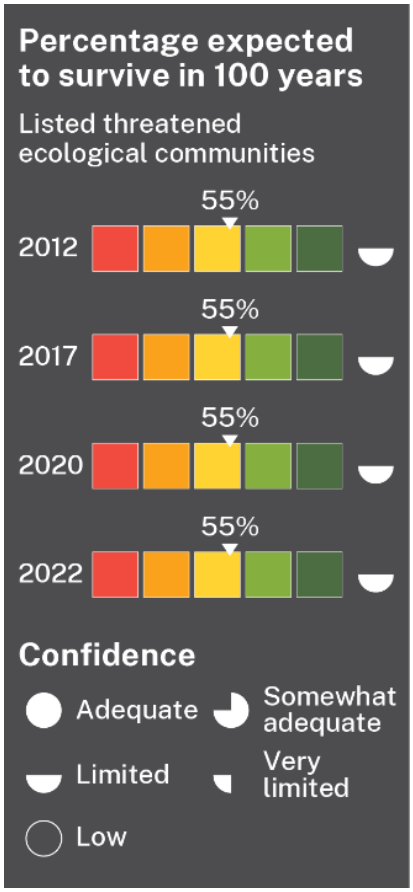


Figure 5 Historical trend in the count of listed threatened species expected to survive in 100 years

Efforts to secure threatened species from extinction aim to slow, halt or even reverse the historical trend.

Estimates for the potential loss of species assume that current threats continue without effective management. A range of programs (Box 2) are in place to alleviate this potential loss by addressing current threats. These programs include the Saving our Species program, the *NSW koala strategy*, national park acquisition, private land conservation, reintroductions of locally extinct species, restoration of habitat, and managing fire and pests.

Listed threatened ecological communities



An ecological community is a grouping of plants, animals and other species that naturally occur together, interacting with each other in the same habitat.

In 2022, over half of listed threatened ecological communities in New South Wales were expected to exist in 100 years.

By the end of 2022, there were 111 ecological communities listed as threatened under the Biodiversity Conservation Act (Box 1). Of these, 62 (55%) were expected to exist in 100 years (Figure 6). The chance of an ecological community existing in 100 years was estimated by the threatened category under which it was listed (Box 1).

Most listed threatened ecological communities are fully terrestrial, with a small number, such as wetlands, transitioning between terrestrial and aquatic habitats (Figure 6). Fully aquatic ecological communities are not counted here (Box 1).

The expected existence of threatened ecological communities in 100 years has remained the same since 1997.

Since 1997, the percentage of ecological communities expected to exist in 100 years has remained the same at 55%. No listed threatened ecological community has changed risk category during this period. This may be due to limited information rather than no change in risk of collapse.

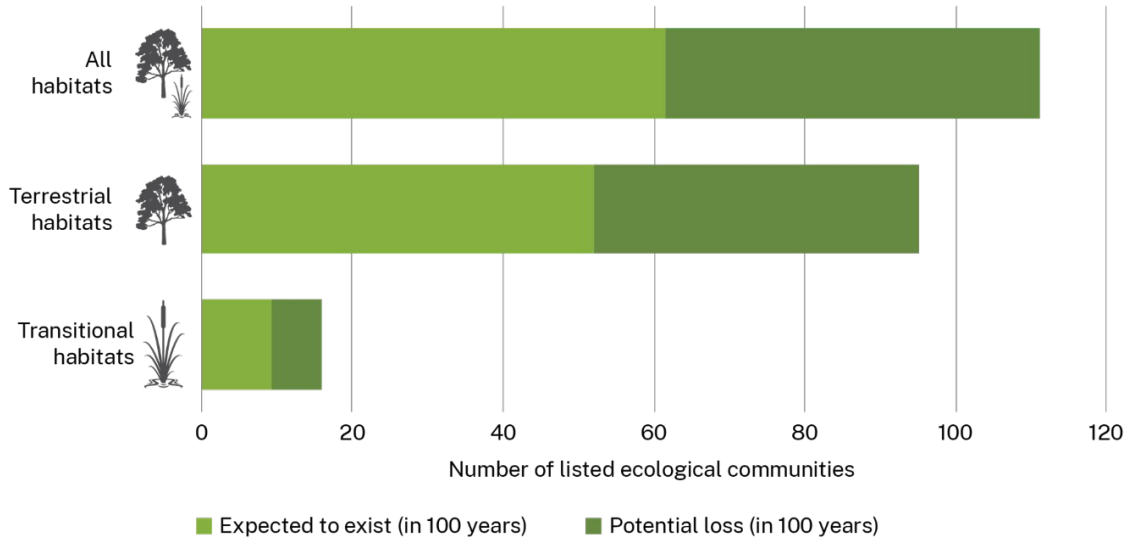


Figure 6 Count of listed threatened ecological communities (in 2022) expected to exist in 100 years from different habitat types and all habitats combined

Box 1 How is conservation status determined?

The conservation status of species and ecological communities can be determined at different scales, from regional to global. Global assessments are done by the International Union for Conservation of Nature (IUCN) for the *IUCN Red List of Threatened Species* and the *IUCN Red List of Ecosystems*. In Australia, assessments are done by either the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999* or by state or territory jurisdictions. In 2016, the Australian Government and all states and territories agreed to a 'common assessment method' for assessing and listing species. All assessments are undertaken at the national scale, covering the full distribution of the species, with the assessment outcome adopted consistently at the national scale and in all states and territories in which the species occurs.

In New South Wales, a species or ecological community can be listed as threatened (critically endangered, endangered or vulnerable) or extinct or collapsed under the *Fisheries Management Act 1994* or the *Biodiversity Conservation Act 2016*. Here we considered only the latter Act, which covers all terrestrial species and ecological communities in New South Wales as well as aquatic species of birds, mammals and reptiles. Assessment of extinction risk for species, populations and ecological communities is undertaken by the NSW Threatened Species Scientific Committee. Anyone can nominate a species, population or community for listing as threatened, and it is the committee's role to assess nominations and make decisions for listing. The committee is also working to align historical listing decisions with the common assessment method.

Threatened species and ecological communities are listed in a category based on the level of threat they face (Table 1). These categories and criteria are aligned with those used by the IUCN, the Australian Government and all states and territories. Criteria for listing include population size and trend, size and trend in geographic range, habitat quality and sensitivity to ongoing threats. Assessments are based on the best available knowledge, but assessments can change in the light of new information, for example, the rediscovery of a species thought to be extinct. Since the results of these indicators are based on the status of species in New South Wales and Australia, biodiversity that is apparently lost may be recoverable if healthy populations occur elsewhere.

Table 1 **Risk categories for species and ecological communities in New South Wales**

Category	Extinction risk
Vulnerable	High risk in medium-term future
Endangered	Very high risk in near future
Critically endangered	Extremely high risk in immediate future
Extinct	No reasonable doubt that the last member of the species has died in the wild
Collapsed ecological community	No reasonable doubt that the community, with its original composition, structure and function, can no longer be found

More information:

NSW Threatened Species Scientific Committee

Box 2 Preventing the loss of biodiversity

There are several conservation programs in New South Wales that directly contribute to ensuring the long-term survival of threatened plants and animals. These programs use scientific evidence to prioritise which species and communities require intervention to secure biodiversity, both within and outside of protected areas (such as national parks). These programs include the Saving our Species (SoS) program, the *NSW koala strategy*, national park acquisition and management, private land conservation, reintroductions of locally extinct species, declaration of assets of intergenerational significance, restoration of habitat, and managing fire, water regimes, weeds and feral animals.

The SoS program aims to maximise the number of threatened species that are secure in the wild in New South Wales in 100 years, and to control the key threats facing our plants and animals. Since its launch in 2016, SoS has implemented conservation projects for over 300 plant and animal species.

In New South Wales, around 85% of all threatened species are partly or wholly represented on the national park estate. The National Parks and Wildlife Service is committed to ensuring that no species go extinct within NSW national parks, and to promoting the recovery of threatened species and ecosystems to healthy and sustainable levels. This includes the establishment of a network of feral predator–free areas to enable the reintroduction of locally extinct species to national parks across New South Wales.

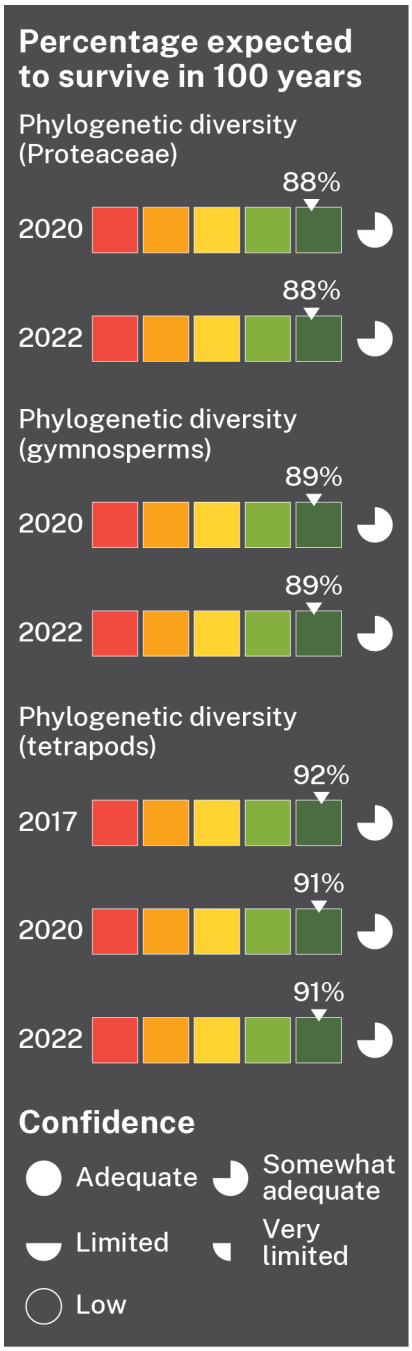
The **expected survival of listed threatened species** indicator can incorporate outcomes of conservation programs in averting loss. In a scenario analysis (Figure 7) that considers monitoring results from 2021–22, SoS projects could increase the number of surviving species from 528 (50%) to 641 (61%) if current project-level outcomes remain on track. Further, reintroduction of locally extinct species (as of 2022) could reduce the number of species expected to be already extinct in New South Wales from 67 (7%) to 56 (5%), if reintroduced populations can be secured into the future.

Figure 7 Possible reduction in future biodiversity loss through conservation programs

More information:

Saving our Species program

Zero extinctions – threatened species framework



Phylogenetic diversity

Phylogenetic diversity is a measure of biodiversity that considers how closely or distantly species are related to each other in an evolutionary sense (Box 3). Phylogenetic diversity is also called evolutionary heritage because it is the total evolutionary history represented by species.

This indicator reports on the percentage of the evolutionary tree for a biological group that is expected to persist in 100 years if certain species survive while others are lost. The chance of a species surviving in 100 years was estimated from their threatened category. Some species, like the Wollemi pine, make large contributions to evolutionary heritage because they are so distinctive, with no close relatives. Losing such a distinctive species would result in the loss of a relatively large proportion of the evolutionary tree. Distinctive species often have unique roles in ecosystems that cannot be replaced.

Phylogenetic diversity is expected to decline over the next 100 years if currently threatened species become extinct.

We assessed 3 biological groups: tetrapods (frogs, mammals, reptiles, and birds), gymnosperms (pines and cycads) and plants from the Proteaceae family (banksias, waratahs and relatives). For each of these groups the total amount of original evolutionary heritage (phylogenetic diversity) in New South Wales was estimated from their respective evolutionary (phylogenetic) trees (Box 3). In 2022, 91% of original phylogenetic diversity of tetrapods is expected to survive in 100 years (Figure 8), declining from 92% in 2017. For gymnosperms and Proteaceae, 89% and 88%, respectively, is expected to survive (Figure 8), and this has not changed since 2020.

Prioritising conservation efforts towards species that are both evolutionarily distinctive and highly threatened will significantly reduce the risk of losing irreplaceable evolutionary heritage.

Much evolutionary heritage has already been lost because of historical extinctions of species. When those species are highly distinctive, losses have been substantial. Securing populations and reintroducing species from other states could dramatically increase surviving evolutionary heritage if evolutionarily distinctive species are prioritised for conservation efforts (Box 3).

Expected survival of biodiversity

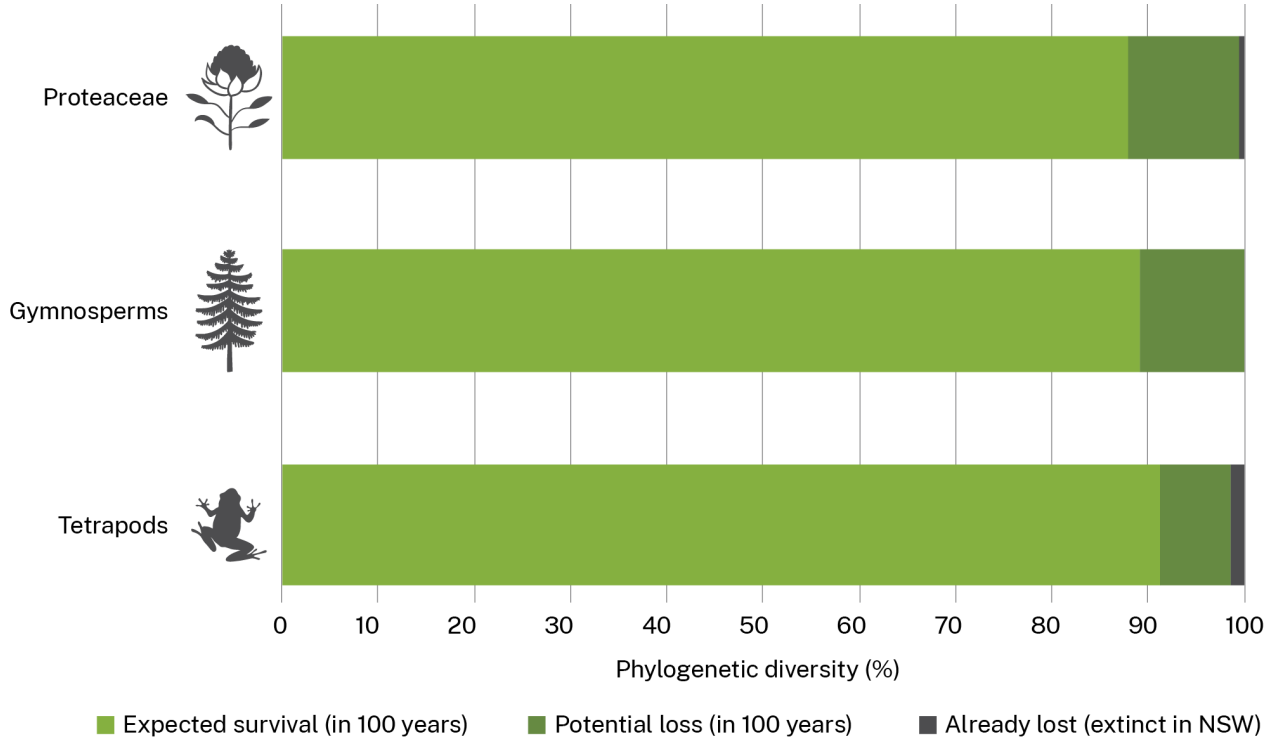


Figure 8 Percentage of evolutionary tree (in 2022) from different biological groups which are expected to survive in 100 years, or will potentially be lost in 100 years, or which are already lost (extinct)

Box 3 Conserving evolutionary heritage

Evolutionary trees tell us how species are related to each other (Figure 9). The tips of the tree represent species and the branches link those species through time. By tracing back along the branches, we find nodes (circles in Figure 9) which represent common ancestors. When the lengths of those branches are measured in millions of years (Ma), we can also estimate how long ago that ancestor lived (numbers in the circles).

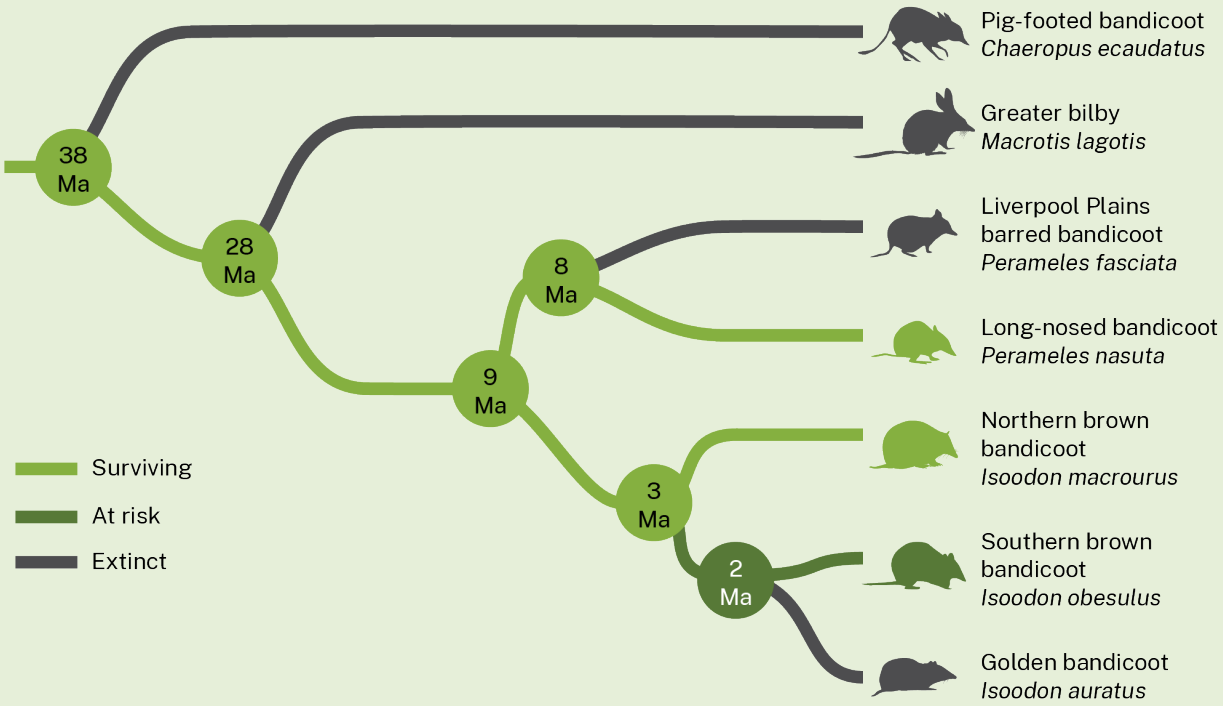


Figure 9 Evolutionary tree of bandicoots of New South Wales showing which branches are expected to survive in 100 years, which are at risk of loss, and which are already lost

Adding up the lengths of the branches, from node to tip or from node to node, gives us a measure of biodiversity called **phylogenetic diversity**. This is also called **evolutionary heritage** because it is the total evolutionary history represented by the species in the tree and the branches connecting them together. We can also see the contribution each species makes. For example, the greater bilby uniquely represents about 28 million years of evolutionary heritage (the length of the branch connecting the bilby to the rest of the tree). Extinction will result in a 'pruning' of the tree, losing those branches that connect the extinct species to the rest of the tree. By calculating phylogenetic diversity before a species is lost (all branches) and after a species is lost (removal of pruned branches), we can estimate how much of the tree remains.

In 2022, only about 40% of the original evolutionary heritage of NSW bandicoots remains. The continuing existence in New South Wales of an entire group of marsupials is now precarious, relying on the survival of just 3 species. And one of these species, the southern brown bandicoot, is endangered. Fortunately, the golden bandicoot and the greater bilby, although extinct in New South Wales, still have populations in other states. The NSW Government is working with partners to reintroduce these species to the wild and recover a significant amount of evolutionary heritage historically lost to the state.

Next steps

Where to from here?

Now that you've read this report card, you have 3 main options for more information. This information can be accessed via the links below.

Biodiversity outlook reports provide a high-level summary of our indicators. The latest outlook report at the time of the release of this report card is the *NSW biodiversity outlook report 2024*, which includes summary results for 13 indicators as well as case studies and research highlights. This report card provides more detailed results for the expected survival of listed threatened species and ecological communities indicator family than is found in the outlook report.

An implementation report provides technical details on the calculation of the indicators, including data workflows.

The NSW SEED (Sharing and Enabling Environmental Data) portal provides access to the data underlying our indicators. A data package presents raw data allowing technical users to do a deep dive with their own analyses.

More information

- A Biodiversity Indicator Program for NSW – webpage
- NSW biodiversity outlook report 2024 – outlook report
- Updating expected survival of biodiversity – implementation report
- Expected survival of listed threatened species and ecological communities 2024 – data package

Glossary

Animal: A member of a biological group of multicellular, mobile organisms which acquire food from their environment. Animals include birds, fish, insects and worms.

Biodiversity (biological diversity): Variety of living things from all sources (including terrestrial, aquatic, marine and other ecosystems and ecological complexes of which they are a part). It includes genetic diversity, species diversity and ecosystem diversity. Biodiversity includes plants, animals, fungi and microorganisms.

Biological group: A group of living things grouped on shared characteristics (for example, birds, insects or trees).

Conservation: In relation to biodiversity, conservation is the protection, maintenance and restoration of the natural environment.

Ecological community: A naturally occurring group of plants, animals and other organisms that interact within a shared habitat.

Ecological integrity: The diversity and quality of ecosystems and their capacity to adapt to change.

Ecosystem: A group of ecological communities and their non-living environment (such as terrain or climate) that interact as a functional unit. Ecosystems may be small and simple, such as an isolated pond, or large and complex, such as a specific tropical rainforest or a coral reef.

Evolutionary heritage: A common currency for measuring phylogenetic diversity where branch lengths in a phylogenetic tree are measured in millions of years of evolutionary history (between dated nodes). The sum of the lengths of branch segments by a set of species (or subspecific taxa) is then the cumulative amount of independent evolutionary history represented.

Evolutionary tree: A branching diagram that represents the pattern of evolutionary relationships between species. A tree consists of branch segments (or edges) connected by nodes, representing evolutionary divergence events. Tips are terminal branch segments connected to the tree by a single node. When nodes are assigned ages, the lengths of the branches are proportional to the amount of the time between divergence events.

Expected survival: Number or percentage of species or ecological communities likely (with a high probability) to persist over some timeframe, for example, 100 years.

Extinct: No individuals are remaining, either within a region or globally. A species is regionally extinct if no individuals remain within a region but are present elsewhere. A species with individuals in captivity but no individuals living independently in the wild would be 'extinct in the wild'. A species without viable populations, which is functionally extinct, in the long-term is not extinct until the last known individual has died. Due to the difficulty detecting rare species, species that are presumed to be extinct are assumed to have a small but non-zero probability of survival.

Extinction risk: A measure of the actual or potential decline and extinction over time of a species or other defined ecological unit, for example an ecological community.

Fungi: A diverse group of organisms in the taxonomic kingdom Fungi, including mushrooms, moulds, mildews, smuts, rusts and yeasts.

Gymnosperm: A group (Gymnospermae) of seed-producing plants that includes conifers, cycads, ginkgo and gnetophytes.

Habitat: An area occupied by a species or ecological community, including all living and non-living components.

Monitoring: In ecology, activities to collect new ecological data.

Phylogenetic diversity: A measure of biodiversity which incorporates the phylogenetic (evolutionary) differences between species. The phylogenetic diversity of a set of species (or subspecific taxa) is the sum of lengths of the branches connecting those species together in an evolutionary tree.

Plant: A group of living organisms that use a chemical process to make their own food from sunlight. Examples include grass, trees, and flowers. Note that under NSW biodiversity legislation, 'plant' includes fungi and lichens but not marine vegetation.

Population: A group of individuals of the same species occurring together in a particular area at a particular time.

Reintroduced: Individuals of a species are deliberately released into suitable habitat to increase the local population or establish a new population. Individuals can be sourced from captive or other wild populations.

Species: A group of living things that share common characteristics and are capable of interbreeding to produce fertile offspring.

Tetrapod: A member of the biological group of 4-limbed vertebrate animals, sometimes referred to as 'higher vertebrates'. Includes all amphibians, mammals, reptiles and birds, including those species with secondarily lost limbs (such as snakes and whales), but excludes fish.

Threatened: A species or ecological community that has a relatively high risk of extinction in the near or medium-term future.

Threatened category: In New South Wales, a species can be listed as either **vulnerable**, **endangered**, **critically endangered**, an **endangered population** or **extinct**. Ecological communities can fall under the same categories, but will be listed as **collapsed** rather than extinct.

Vascular plant: A member of the biological group of land plants with specialised tissues for conducting water and minerals, sometimes referred to as 'higher plants'. Includes all ferns, pines, cycads and flowering plants, but excludes mosses.