NSW GOVERNMENT | Office of Environment & Heritage

Saving our Species
Landscape species strategy

Together we can secure threatened species in NSW

saving our species

Cover image: Scarlet robin. Photo: J. J. Harrison

Published by:
Office of Environment and Heritage
59 Goulburn Street, Sydney NSW 2000
PO Box A290, Sydney South NSW 1232
Phone: +61 9995 5000 (switchboard)
Phone: 131 555 (environment information and publications requests)
Phone: 1300 361 967 (national parks, general environmental enquiries, and publications requests)
Fax: +61 9995 5999
TTY users: phone 133 677, then ask for 131 555
Speak and listen users: phone 1300 555 727, then ask for 131 555
Email: info@environment.nsw.gov.au
Website: www.environment.nsw.gov.au

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ISBN 978 1 76039 191 1
OEH 2015/0824
November 2015

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Introduction

Saving our Species (SoS), the overarching framework for threatened species management in NSW, delivers strategies for species recovery and threat abatement as set out in the Threatened Species Priorities Action Statement (PAS) under Part 5A of the *Threatened Species Conservation Act 1995* (TSC Act). The key objective of SoS is to maximise the number of threatened species that are secure in the wild in NSW for 100 years, by:

- optimising investment in management of threatened species and communities through the identification of priorities
- engaging the community and aligning efforts across NSW in the effective management of threatened species and communities
- making decisions about on-going management of threatened species and communities based on best available evidence and evaluation of outcomes.

The first stage of the program has been developed and implemented. All species were allocated to a **management stream***;* with those allocated to the site-managed, iconic and data-deficient streams having undergone an expert review process to develop detailed, targeted, measurable and achievable projects.

The second stage includes developing projects and actions for species allocated to the landscape management stream. This landscape strategy aims to explain the principles that apply to the development of conservation projects for landscape species under SoS and guide investment towards maximising outcomes for landscape species and their habitat across NSW.

The objective for landscape species is a step in achieving the overall objective for SoS (Figure 1). The objective for landscape species is:

> *To maximise the viability of species and their habitat by strategically investing in priority locations, threats and management actions, identifying key legislative mechanisms and working in partnership with stakeholders across NSW.*

SoS defines landscape species as typically being widely distributed, highly mobile or dispersed, and best recovered by managing threats associated with habitat loss or degradation at a landscape scale. Landscape species are predominantly birds, mammals, frogs and reptiles (a full list of species currently allocated to the landscape stream is available at www.environment.nsw.gov.au/savingourspeciesapp/managementstream.aspx?managementstream=landscape).

A number of different programs implemented by various state agencies and non-government organisations across the landscape are currently addressing the requirements of these species (e.g. rehabilitation and restoration programs, reserve management, connectivity initiatives). Identifying policy and legislative channels to safeguard the habitat of landscape species from illegal land-clearing and inappropriate development is also being explored.

For example, the freckled duck (*Stictonetta naevosa*) is a wetland dependent species that is widely distributed in NSW and threatened by draining and clearing of wetlands, changes to natural river flows, grazing and trampling of wetland habitat by stock and illegal shooting. At a landscape and local scale, water management (and thus the management of some threats) is regulated under the NSW *Water Management Act 2000*. In addition, the SoS program will prioritise investment in localised site-based actions that protect and/or restore critical breeding habitat and control the impacts of stock grazing in wetlands.

Under SoS threatened species in NSW are allocated to one of six management streams according to their distribution and ecology and how much we know about them. Targeted actions are being developed for each species in each stream.

In addition to managing threatened species in six management streams, a third stage of the SoS program (in 2015–16) will address broad- and ecosystem-scale threats. This will be done through the SoS approach to threatened ecological communities and key threatening processes listed in the TSC Act.

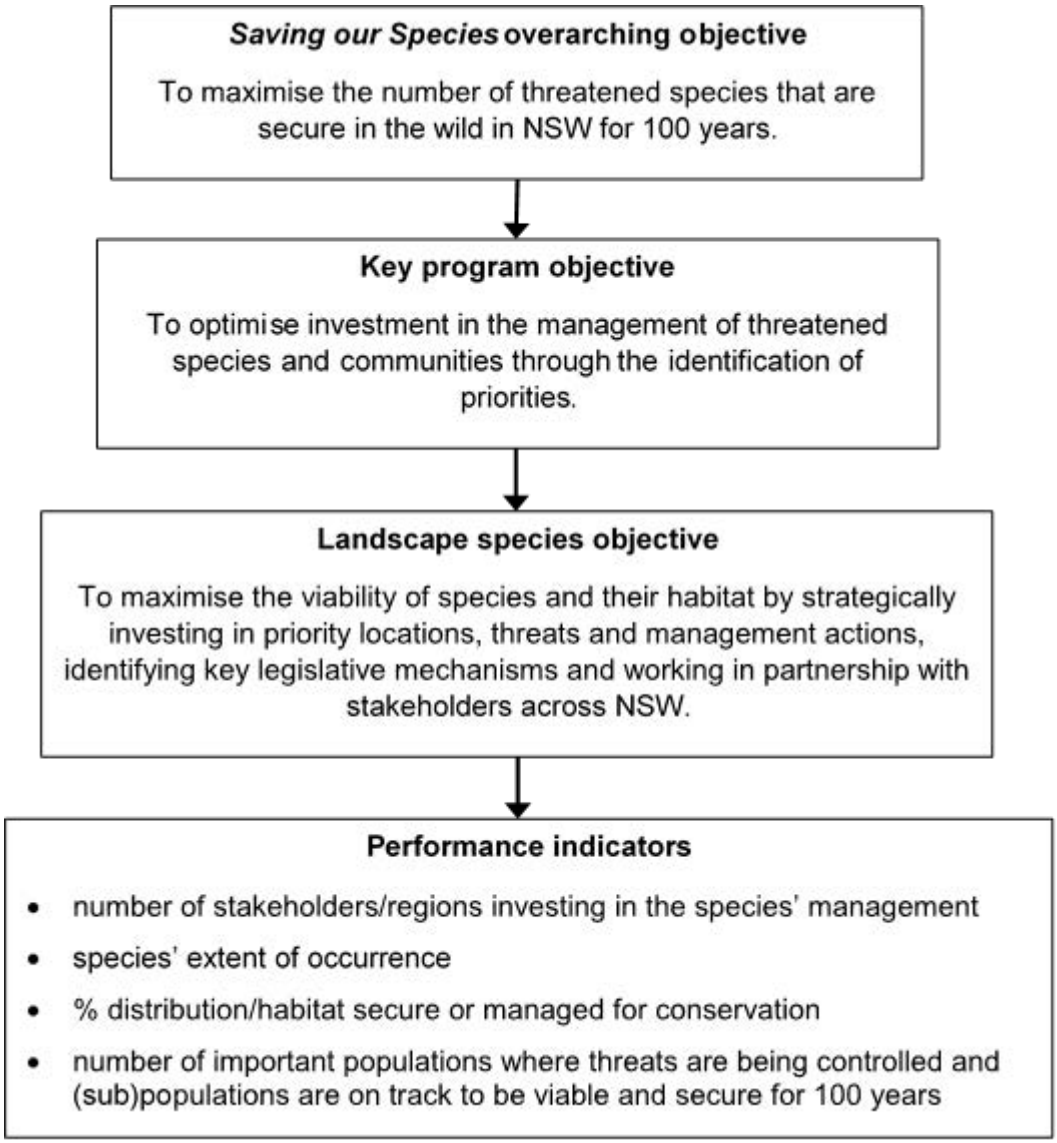

Figure 1: Landscape species objective in the context of SoS objectives

Landscape species approach

Conservation projects developed for landscape species under the SoS program must fulfil strategies set out in the PAS, developed under section 90A of the TSC Act. The PAS:

- sets out the strategies to be adopted for promoting the recovery of each threatened entity
- establishes relative priorities for their implementation;
- establishes performance indicators to facilitate reporting on the effectiveness of these strategies
- contains a status report on each entity where information is available
- sets out a clear timetable for recovery and threat abatement.

A critical prerequisite for the long-term viability of landscape species is 'a large area of high condition, well connected habitat across their geographic range'. This habitat could be found

on private, leasehold or public lands. Generally, increasing the restoration of habitat and retention of vegetation can be achieved via mechanisms such as reserve establishment, private land conservation, native vegetation legislation and development assessment and approval processes. However, this is rarely all that is required to control all threats to any given species. Many landscape species are impacted by pervasive threats such as vertebrate pests and inappropriate fire (Table 1; many of these are listed as Key Threatening Processes under the TSC Act and will also be managed as such), which require active intervention, irrespective of land tenure.

Therefore, the approach to landscape species under SoS incorporates two separate components:

1. identifying and securing areas where the species is known to occur and/or where there is suitable habitat required by the species to survive and reproduce in NSW, and
2. rehabilitation/restoration of habitat and/or threat abatement at important locations/populations requiring site-based management to ensure their long-term security.

Both components represent the SoS priorities for each landscape species and should inform stakeholders investing in broad scale reserve planning, restoration, planting, connectivity and/or private land conservation projects, as well as in targeted on-ground activities with specific objectives relating to species populations.

Table 1: Threats most frequently affecting landscape species

Threat category	Species affected (%)
Habitat loss / clearing*	94
Feral predators*	63
Stock grazing	59
Inappropriate fire*	51
Human disturbance	26
Feral browsers*	26
Hydrological disturbance	23
Chemical run-off	22
Forestry activity	19
Weed invasion*	19
Firewood collection*	18
Climate change impacts*	16
Chytrid fungus*	13
Illegal collection	10

* Associated with a Key Threatening Process under the TSC Act.

Source: Adapted from the Atlas of NSW Wildlife (BioNet) data

Defining the distribution of species and habitat

A map for each landscape species describing its geographic range, habitat distribution or area of occupancy, to as high a resolution as available data allow, has been developed to assist stakeholders in identifying areas where the species is known or is likely to occur. The following information sources were used:

- Species of National Environmental Significance mapping
- Australian Bird Distributions and Climate Change project
- Atlas of NSW Wildlife (BioNet) and Atlas of Living Australia

- NSW BioNet species vegetation associations
- Environmental attribute mapping (e.g. vegetation [Native Vegetation Information System], soil [Atlas of Australian Soils], geology [Geoscience Australia])
- Other species-specific distribution or habitat suitability models.

It is noted that there is likely to be high uncertainty about species' distributions, habitat associations and the accuracy of mapping (or all three) for many species, particularly for areas of western NSW. Where this uncertainty was too great to define a meaningful, useful model, species were allocated to the data-deficient management stream with habitat mapping assigned as a priority research action.

The species maps, when used either in isolation or overlaid with co-occurring species, provide indicative locations for investment in landscape-scale habitat management; and/or enhancing the extent, condition or connectivity of habitat for one or more landscape species (targeting areas to benefit multiple species with similar habitat requirements is likely to be the optimal approach). This will, in turn, contribute to the landscape species objective (Figure 1).

Identifying critical management actions: the 'action toolbox'

Data describing threats to each species, and general management actions required to recover species, already exist in BioNet and the PAS, respectively. This data was reviewed by species experts (in consultation with the relevant OEH accountable officer) and refined to produce a concise list of critical management actions, each with an associated scale for implementation (i.e. site, area or state; Table 2), and are presented for each landscape species in an 'action toolbox' in the SoS database. The species' toolboxes define specific, practical and meaningful actions (e.g. fencing habitat, controlling feral pigs) for controlling critical threats and securing populations on the ground. The actions are designed to guide stakeholders investing in the species' management and contributing to SoS objectives, irrespective of scale (i.e. individual landholders through to state-wide agencies).

Table 2: Definitions of three scales of management for the action toolbox

Scale	Definition
Management site	Single or group of properties, single reserve or patch of contiguous habitat that can be managed as a single unit.
Management area	Group of sites or geographic area containing multiple sites that can be managed to address a landscape-scale threat.
State-wide	The species' full geographic range within NSW.

Identifying important locations and decision making

The landscape species projects also define specific site-based management and threat abatement activities that contribute to securing populations of landscape species, thereby contributing to the overall viability of the species.

Nominations of important locations or sites can originate from any stakeholder in the species' management (e.g. OEH staff, local government, NRM agencies, community groups, researchers) at any time, but ultimately, the management recommendations presented as SoS priorities must be based on rigorous data and be cost-effective. To ensure transparency and fairness the SoS program uses expert advice in assessing nominations of management sites against the following set of principles.

The proposed site-based projects for landscape species must:

- demonstrate the presence of a significant population or habitat
- have an objective to secure a viable population of the species or contribute significantly to the long-term viability of the NSW population

- propose to manage a threat(s) that is critically affecting the species' long-term viability (i.e. significantly constrains survival or reproduction)
- have lasting effects and a reasonable likelihood of success, or if there is significant risk of failure, this is offset by high benefit (if successful) or low implementation costs
- involve managers that have the capacity, expertise and influence required to meet its objectives
- have clearly defined population targets and a rigorous method for evaluating outcomes against those targets (consistent with the SoS MER framework).

Investment prioritisation

There are limited resources to undertake all the management required by all threatened species everywhere they occur. Prioritisation of investment is necessary, and also required under Section 90A(b) of the TSC Act. For the site-managed species under SoS, a project prioritisation protocol (Joseph et al. 2009)[1] is being used as a decision-support tool for guiding investment.

A key principle of SoS is to ensure that the limited resources available for threatened species are invested where they are most likely to deliver the greatest outcomes, hence the need for an objective and transparent method of prioritisation. Investment in site-based management of important locations for landscape species will be prioritised by using the following qualitative criteria to compare competing projects:

1. amount of data on the system available as a baseline against which to measure outcomes or to demonstrate likelihood of success.
2. proportion of the species' NSW population or distribution, or its strategic importance to the long-term viability of the species in NSW (including consideration of species capacity to adapt under climate change)
3. predicted amount of multiple benefits to species or other biodiversity assets.
4. extent of broader community support, partnerships, or the capacity to leverage significant additional investment
5. capacity of the project to obtain and disseminate knowledge that can be applied to other populations, species or habitats in NSW
6. project's cost-effectiveness (i.e. predicted benefit of outcomes relative to total implementation cost).

In some cases, species' geographic distributions, habitat requirements and threats may overlap in such a way that it will be prudent to define a site-based project that targets management of multiple landscape species (with additional/non-target species receiving some complimentary benefit). Under these circumstances, the project should be developed and implemented as a single project, but multiple (similar) projects associated with each target species will be documented within the SoS database, so that the management of each threatened species is evaluated as contributing to the overall program objective.

It should be noted that the above prioritisation criteria are qualitative, however, they can be quantified via a scoring and/or weighting system to facilitate simple ranking of projects. When prioritising investment on public (e.g. reserve) estate, decisions should also consider efficiencies that maybe created by aligning existing projects and programs (e.g. threat abatement plans) with other programs where similar objectives apply.

Under this framework, the definition of a management site does not prescribe a particular scale. Irrespective of the size of the site, the above principles and prioritisation criteria should apply. Likewise, there is no limit to the number of management sites that can be defined for a particular species, however, decisions regarding investment in any given site should be made in the context of the current level of investment in other sites for that

[1] Joseph, LN, Maloney, RF and Possingham, HP (2009), 'Optimal allocation of resources among threatened species: a Project Prioritization Protocol', *Conservation Biology* **23**(2): 328–338.

species across the state (i.e. generally, the relative benefit of a given management site to the species' viability in NSW will decrease with increasing number of sites already under management).

The spatial distribution of nominated management sites is also important, particularly in the context of species' adaptive capacity under climate change. A crucial factor when making decisions about investment among potential management sites should be maximising the range of particular environmental variables (e.g. habitat type, rainfall, temperature, topography, geology) and geographic extent captured, as surrogates for genetic diversity. Essentially, this is a special case relating to the second prioritisation criterion above (i.e. the site's strategic importance).

To provide additional context and information to support decisions by regional stakeholders with respect to investment in landscape species at larger scales (e.g. restoration, rehabilitation or connectivity programs), the following types of data (easily derived from existing sources) will also be provided for each species and held in the SoS database:

- a list of required or important habitat features (e.g. tree hollows, fire history)
- proportion of habitat area on secure tenure (i.e. reserve, covenant)
- species endemism (number of regions with occurrence)
- other landscape species with overlapping habitat area
- site-managed project sites intersecting with habitat area
- OEH programs currently targeting the species (e.g. fox Threat Abatement Plan)

Contribution of existing policies and programs

For some landscape species, due to their distribution or ecology, it may be neither possible nor practical to identify particular locations that require targeted management. For example, species that are so highly dispersed or mobile that discrete populations within their range are not discernible (e.g. some predatory bird species), but the species is reliably associated with particular habitat types or features wherever they occur. For such species the most effective management tools will be legislation (e.g. *Environmental Planning and Assessment Act 1979* and other biodiversity legislation) and programs (e.g. invasive species and fire management, various private land conservation mechanisms) designed to protect threatened species and promote biodiversity state-wide.

Landscape-scale monitoring, evaluating and reporting (MER)

Evaluating outcomes at the landscape scale is challenging due to the inherently large spatial scales and effort involved in monitoring, the variability in habitat features and tenure, and the high uncertainty in species occurrence. Therefore, it is generally not cost-effective to attempt to monitor and evaluate species' population status everywhere they occur. Instead, monitoring should be strategic and cost-effective; targeted to where it is likely to return the most useful data for the least investment.

In practice, this means that the majority of monitoring should focus on assessing the effectiveness of management and the trajectory of local populations at the site (subpopulation) scale.

Monitoring of a landscape species' population across its (NSW) geographic range may be justified under certain circumstances, where:

- detectability of a trend or response to management is proportionate to the cost (and this cost-effectiveness is comparable to other projects)
- the design is scientifically rigorous and statistically powerful
- there are clearly articulated triggers for management in response to monitoring results
- if some or all of the above are not met, this is offset by significant community engagement or citizen science benefits.

The MER framework for landscape species – similarly to site-managed species – is underpinned by a program logic (Figure 2). The model comprises two components, consistent with the two scales of management outlined above.

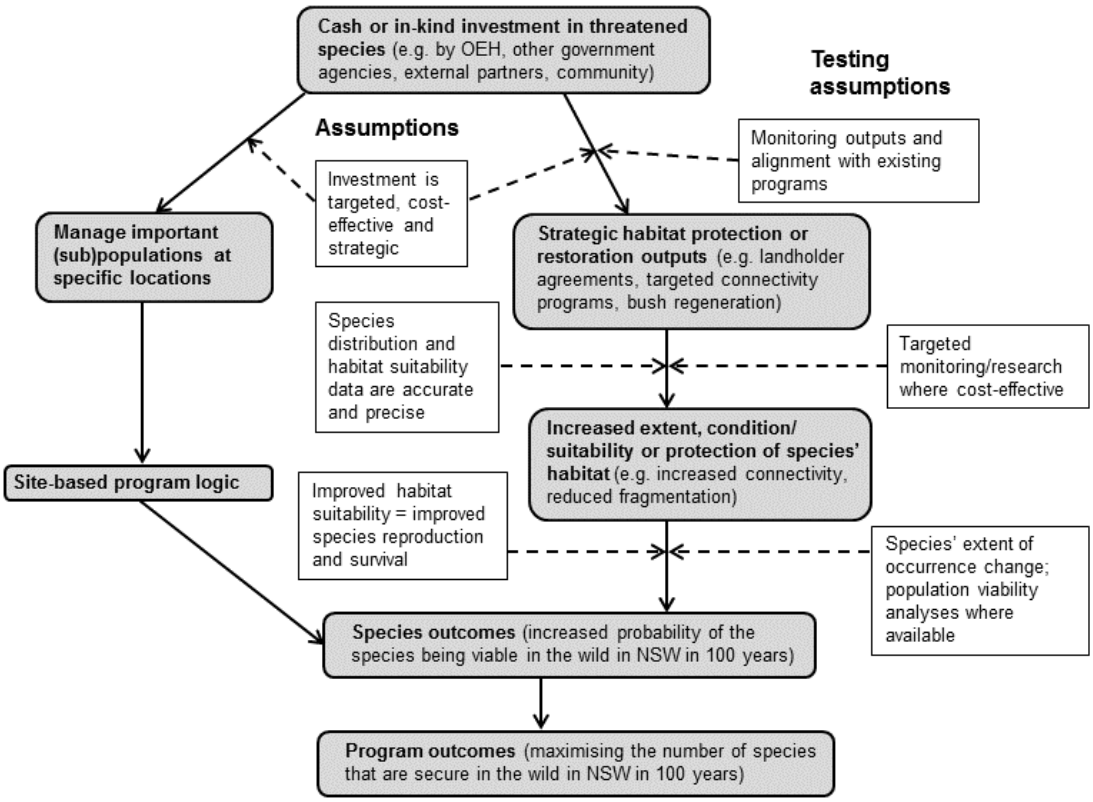

Figure 2: Program logic describing landscape-scale management under SoS

With respect to monitoring threat impacts at a landscape scale, for most threatening processes this is likely to be prohibitively resource-intensive. However, monitoring designed specifically to elucidate threat dynamics and inform more effective management, can be cost-effective. This is particularly true for threats that impact a large number of species and where there is currently significant uncertainty associated with their management (e.g. cat/fox predation).

The most frequent threat to landscape species is habitat loss and degradation (Table 1), which can be measured (coarsely) using relatively cost-effective desktop tools. It is proposed that the proportion of each species' habitat subject to vegetation clearing will be assessed on a regular basis using the species' habitat distribution models and Landsat imagery data. This will provide an index of relative intensity of the threat of habitat loss across the landscape for each species.

Other significant threats affecting species across the landscape at the state scale will be addressed in more detail via the SoS strategy for Key Threatening Processes, to be developed as part of the next stage of the program.