

Biodiversity 2037 Monitoring, Evaluation and Reporting Framework Version 1.0

Protecting Victoria's Environment – Biodiversity 2037



Photo credit

Steve Sinclair. Monitoring at Truganina Cemetery 2015

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Glossary

Term	Definition
Activity	The process of using labour and materials to produce outputs.
Adaptive management	A systematic approach for improving management by learning from management outcomes
Assumptions	Documented relationships between components of the logic framework
Effectiveness	Achievement of desired management outputs. Where efficiency refers to the value for the process, effectiveness refers to the quality of the result
Evaluation	Periodic assessment of policies, programs and projects against key evaluation questions
Goal	A qualitative description of what is desired in the long term.
Key evaluation questions	Pre-determined questions which frame periodic evaluation of the performance of policies, programs and projects. The questions focus on impact, appropriateness, effectiveness, efficiency and legacy
Key performance indicator (KPI)	A quantitative or qualitative factor or variable that provides a simple and reliable basis for assessing progress towards outcomes. It is a unit of information measured over time that can help show change in a specific condition. A given goal or outcomes can have multiple key performance indicators
Logic framework	A conceptual model that shows the rationale behind a program or strategy. Outlines the anticipated cause-and-effect relationships between activities, outputs, outcomes and goals
Management	Activities conducted as part of a specific plan, strategy, program or project
Outcome	The impact of planned outputs measured during the timeframe specified
Output	The measurable result (goods or service) of activity over a fixed period of time delivered to a standard
Research	Targeted research, documented through robust experimental design, to improve our understanding of how outputs contribute to longer term management outcomes
DELWP Standard output	An agreed output that is part of a list of outputs that forms the basis for investment and planning purposes.
Targets	Quantitative and qualitative, temporally and spatially bound, predicted outcomes or outputs.

Introduction

Protecting Victoria's Environment – Biodiversity 2037

Protecting Victoria's Environment – Biodiversity 2037 (Biodiversity 2037) is Victoria's new twenty-year plan for the future of Victoria's biodiversity. It sets the ambitious and achievable task of stopping the decline of our biodiversity. It also marks the start of a long-term pathway for the overall improvement of biodiversity, while sustaining the state's strong economy.

Victoria's natural environment is richly diverse, unique and precious. It has a spectacular array of natural assets – ranging from forests and coastlines, grasslands and mallee shrublands and alpine environments, to green spaces in cities and towns – that support rich and diverse plant and animal life.

Victorians treasure the environment not just for its sake, but for its indispensable value to individuals, communities, Aboriginal Victorians and society as a whole. Healthy ecosystems have an intrinsic value as well as providing Victorians with an abundance of benefits, from fresh food and clean air and water, to recreational opportunities, tourism and economic prosperity. Our environment provides vital life-sustaining resources and supports many of the productive activities that generate value for Victorians, boost jobs and attract millions of tourists each year. Victoria's natural environment is fundamental to the cultural practices of Traditional Owners and Aboriginal Victorians and to the health and wellbeing of every Victorian.

Biodiversity 2037 recognises the intrinsic connection of Traditional Owners to Country and acknowledges their contribution in the management of land, water, the natural landscape and our built environments. It acknowledges that the land is of spiritual, cultural and economic importance to Aboriginal people.

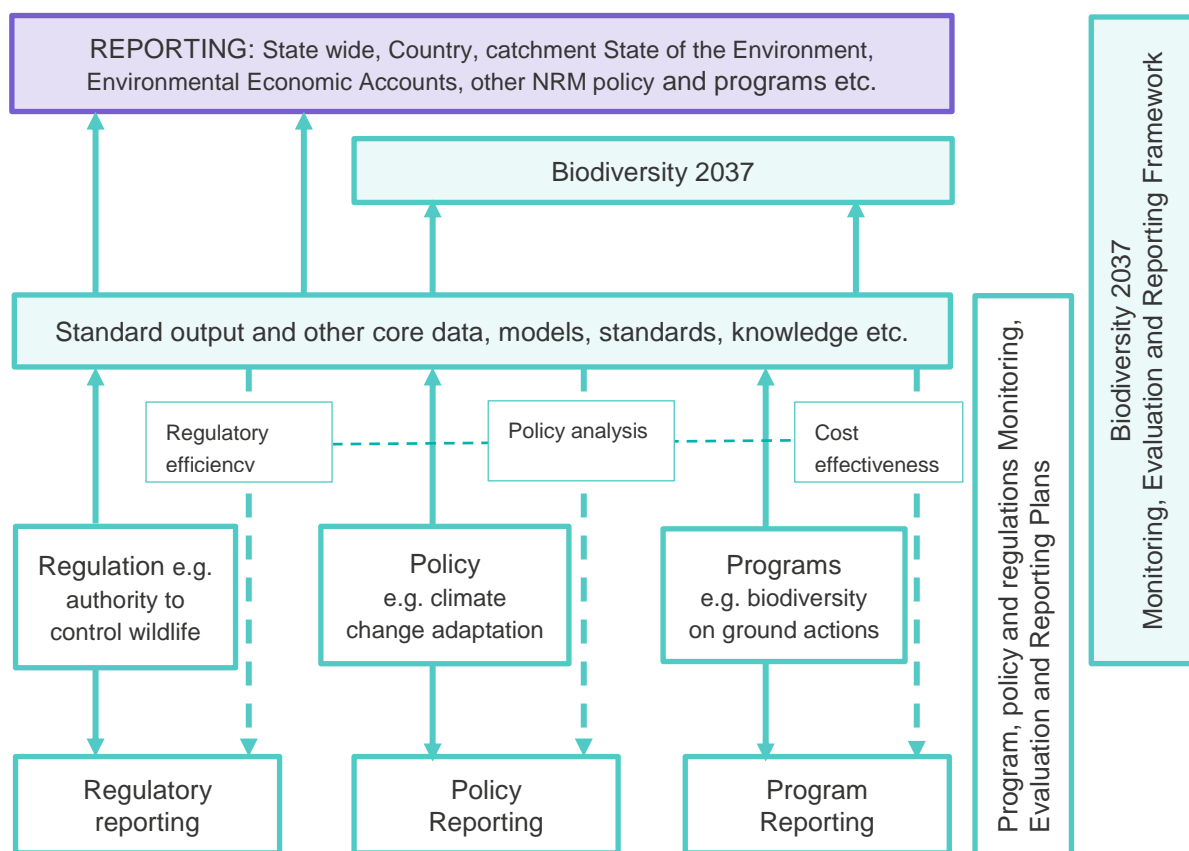
While many Victorians make a significant and concerted contribution to caring for Victoria's biodiversity, more needs to be done. A 2013 report, *State of the Environment*, described a concerning outlook for Victoria's environmental condition. It showed that many species were at risk from a range of pressures such as habitat loss, fragmentation and degradation – pressures that are likely to be considerably magnified by climate change.

The success of Biodiversity 2037 will rely on a collaborative and cooperative approach from all partners and stakeholders to ensure our investment and actions to improve the health of Victoria's biodiversity are effective and efficient. Biodiversity 2037 sets out a state-wide framework to tackle the challenges to biodiversity over the next twenty years. It provides the overarching vision and goals for biodiversity and sets out the targets and priority actions to not only stop the decline of Victoria's biodiversity, but to put it on a path to recovery. These will be achieved through a range of mechanisms including:

- collectively investing in conserving biodiversity
- engaging the community in decisions that affect them
- respecting the rights, culture, values, innovations, practices and knowledge of Aboriginal peoples
- regulating to manage risks of further damage and minimise overall costs to the public.

Vital to this approach will be a comprehensive Biodiversity Monitoring, Evaluation and Reporting Framework (Bio37-MERF) that underpins the strategic decisions and actions that will safeguard our biodiversity for generations to come (Biodiversity 2037 Implementation Framework - Action 20.1). Individual programs, mechanisms or policies have tailored information requirements and evaluation needs in order to support their delivery and reporting. However, it is important to understand the impact of each program in contributing to the Biodiversity 2037 targets and enable value for money comparisons between mechanisms and programs (Figure 1). The Bio37-MERF can support this through:

- providing standards, shared core data requirements and processes which promote collaboration, information sharing and co-investment
- measuring progress against key indicators and providing processes and prioritisation to improve effectiveness through new knowledge and understanding of emerging trends
- recognising multiple sources of knowledge (e.g. science-based, cultural, community) and ensuring that knowledge is freely shared and used as a foundation for decision-making and acknowledging the limitations and uncertainties of available knowledge and continually improving it.



Effective partnerships will be established, with scientists, policy makers, community groups, partner organisations and program implementers all committed to systematic and ongoing data collection.

Figure 1: Nested approach to biodiversity monitoring, evaluation and reporting

Purpose and scope of the Biodiversity 2037 Monitoring, Evaluation and Reporting Framework

Evaluating the long-term consequences of environmental change and human land use, and measuring progress in response to conservation and management actions are essential components in protecting Victoria's environment. The purpose of the Bio37-MERF is to:

- provide guidance to the biodiversity sector on information and knowledge requirements
- demonstrate accountability to the community and report on progress in achieving the targets set out in Biodiversity 2037
- provide evidence in both the short and long term to demonstrate the level of investment needed to stop and reverse biodiversity decline
- ensure that the management of Victoria's environment is evidence-based and effective
- celebrate achievement and promote progress
- embed continuous improvement into the tools we use for modelling, mapping and making decisions
- ensure there is sufficient knowledge of the conservation requirements of our fauna and flora to underpin effective conservation and management.

The Bio37-MERF provides an overarching framework for monitoring, evaluation and reporting (MER) of biodiversity related strategies, regulations and programs which may have tailored MER plans with additional data requirements or program specific Key Performance Indicators (KPI) (Figure 1). It does not cover compliance or funding acquittal and reporting processes although data collected and analyses undertaken through the Bio37-MERF will support program level needs. These activities are monitored and reported through existing arrangements directly with the funding or responsible organisation.

The key components of Bio37-MERF are:

Logic framework – This describes the relationships between activities and processes, outputs, outcomes and goals under Biodiversity 2037. It provides a framework for determining program assumptions, key evaluation questions and key performance indicators (KPIs).

Monitoring progress through Key Performance Indicators – These have been developed for program outputs, outcomes and goals in Biodiversity 2037 and will be used to measure progress towards their achievement. In some cases, multiple KPIs have been developed to provide a better understanding of the progress against the outcome. Protocols have been developed for each KPI and set out how monitoring will be undertaken, including where monitoring will occur, the types of data to be collected and the frequency of data collection.

Improving effectiveness through new knowledge – This is research that seeks to test and validate program assumptions, and the assumptions and knowledge that support the modelled outcomes vs on-ground observations from the Biodiversity Plan decision models (People valuing nature model and Strategic Management Prospects model). This will inform improvements to the models as well as improvement in works standards, and on-ground activities.

Monitoring emerging trends – This is generally focused on monitoring biodiversity trends outside the direct influence of management.

Measuring direct change at a project scale – Local scale MER projects to measure the direct change attributable to an action. Includes but not limited to: monitoring of particular species, habitats, threats or vegetation communities in response to specific management actions at a specific location, monitoring the outcome of particular activities through citizen science or Aboriginal customary knowledge action learning projects.

Reporting – A two yearly report on the delivery of enabling actions in the Biodiversity 2037 Implementation Framework will be compiled by the Department of Environment, Land, Water and Planning (DELWP). The Commissioner for Environmental Sustainability Victoria will report on progress towards the targets of Biodiversity 2037 in conjunction with five yearly State of the Environment reporting. Data collected through the Bio37-MERF will also support other types of reporting including annual, program and policy reports as well as reporting for other sectors such as the water and health sectors and for Traditional Owners to get a better understanding of biodiversity activities across their Country.

Evaluation – A five yearly evaluation of implementation of Biodiversity 2037 will be undertaken to ensure that the program is being delivered efficiently and effectively. These will inform any necessary improvements to the implementation of the program.

These key components (Figure 2) are described in more detail in the following sections of this document.

Biodiversity 2037 Monitoring, Evaluation and Reporting Framework Version 1.0

Bio37-MERF Version 1.0 includes KPIs related to the Healthy natural environment goal, however there are a number of gaps in our knowledge and understanding of how to achieve the Victorians value nature goal, and further work must be done to identify KPIs and targets for this goal.

The document highlights next steps or enabling actions that will be undertaken over the next 1-2 years in order to complete the remaining elements of the Bio37-MERF. This includes further development of the Victorians value nature model, identification of KPIs to support outcomes and their baselines, development and design of tools and a knowledge framework. The Bio37-MERF will be updated following completion of these actions. The Bio37-MERF may also be updated as a result of actions undertaken to improve the models and clarify targets, research results or a review or evaluation of Biodiversity 2037.

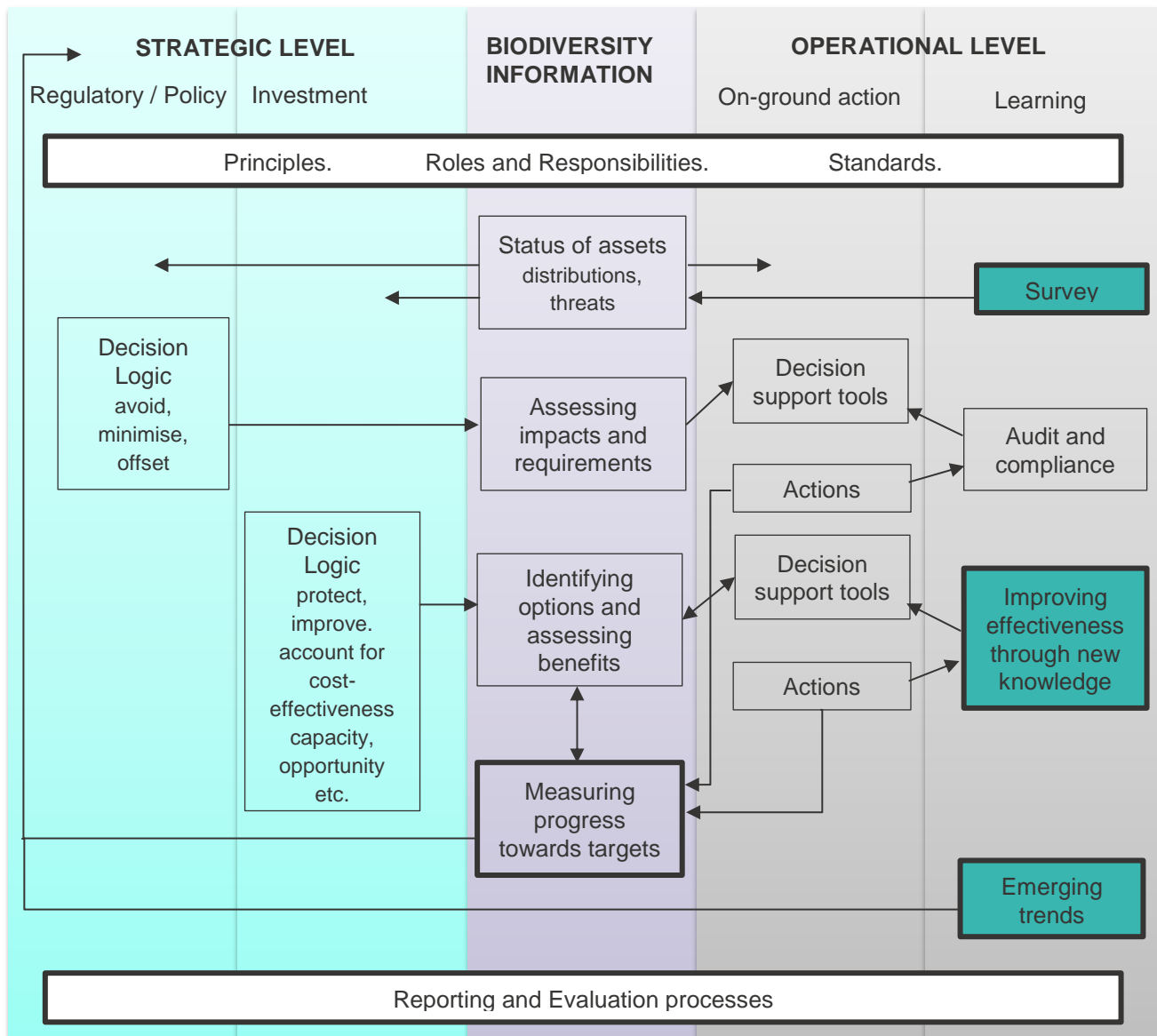


Figure 2: Relationship between Bio37-MERF elements and operation and strategic programs (bold outlined boxes indicate elements of Bio37-MERF, dark green boxes indicate areas of investment in new knowledge)

Logic framework

Logic framework

The logic framework for Biodiversity 2037 (Figure 3) describes the overarching relationships between biodiversity activities and processes, outputs, outcomes and goals and how activities are expected to lead to outcomes as well as the general assumptions that underpin Biodiversity 2037. The purpose of the logic framework is to provide an outline for:

- identifying key evaluation questions and key performance indicators
- undertaking research and informing improvements to the implementation of Biodiversity 2037
- communicating with key stakeholders about Biodiversity 2037.

The goals of Biodiversity 2037 will be achieved through the implementation of a range of activities including on-ground management, protecting biodiversity on private land, activities to increase awareness and connection with nature, supporting Aboriginal access to biodiversity for economic development and education and capacity building to enable more Victorians to act to protect biodiversity.

The Biodiversity 2037 Implementation Framework sets out a range of enabling actions that will be undertaken to support the on-ground actions and ensure the effectiveness of Biodiversity 2037. These include biodiversity response planning, seeking sustainable funding, legislative reform and greater collaboration and leadership in the biodiversity sector in Victoria.

The logic framework will be supported by two decision support models: Victorians value nature model and Strategic Management Prospects (Healthy Environments) model (see below). There may also be species, communities or behaviour change models (such as Population Viability Analyses) that are nested within the two decision support models and provide finer scale detail where required.

Each model has subject specific assumptions and knowledge (e.g. on species, threats, likelihood of success or delivering the predicted outcome, changes in human behaviour etc.) built into it. The decision support models will be used for multiple objectives including to:

- prioritise management actions in order to deliver outcomes
- provide a means of collating and consolidating information relevant to the management of the species and communities or changes in behaviour
- provide a transparent repository of information that can be updated over time and encourage contribution from the scientific community
- provide a transparent exploration of the trade-offs between the benefits of different actions
- identify key uncertainties relating to the management of species and communities or behaviour change and thus assist in prioritising research.

Goals	Victorians value nature: Victorians understand that their personal wellbeing and the economic wellbeing of the state are dependent on the health of the natural environment.	Victoria's natural environment is healthy: Victoria has functioning plant and animal populations, improved habitats and resilient ecosystems, even under climate change.
Outcomes	<ul style="list-style-type: none"> By 2037, all Victorians connect with nature By 2037, 5 million Victorians act to protect the natural environment All Victorian Government organisations that manage environmental assets contribute to Environmental Economic Accounting 	<ul style="list-style-type: none"> By 2037 no vulnerable or near-threatened species will have become endangered By 2037, all critically endangered and endangered species will have at least one option available for being conserved <i>ex situ</i> or re-established in the wild (where feasible under climate change) should they need it By 2037 there will be a net gain in the overall extent and condition of habitats across terrestrial, waterway and marine environments
Outputs	<ul style="list-style-type: none"> Build on existing and create new opportunities for Victorians to connect with nature and to act to protect the natural environment. 	<ul style="list-style-type: none"> Establish and maintain a sufficient amount of key management regimes in priority locations to deliver the outcomes.
Response actions	Including: on-ground actions, expanded support for Friends groups, Landcare, cross government partnerships, land management, land security, workshops, restoration, training, campaigns, cultural activities etc.	
Enablers and Inputs	Including: sustainable funding model, information, biodiversity response planning, legislation, regulation, governance, leadership across Government, collaboration,	

Figure 3: Biodiversity 2037 Logic Framework

Assumptions

The logic and achievement of the goals of Biodiversity 2037 are underpinned by a number of assumptions which are provided below. The logic framework will be updated as new knowledge becomes available that verifies or refutes these assumptions. This list does not include the subject specific assumptions that relate to the decision support models described above.

The assumptions will form the basis for testing the logic framework, undertaking evaluation and improving the implementation of Biodiversity 2037. In some cases, additional data may be collected as part of research or long-term trend monitoring to test the assumptions.

The assumptions are:

- increasing knowledge and awareness of the natural environment will lead to increases in Victorians valuing and acting to protect nature
- the natural environment can help reduce the impacts of climate change
- there will be increased and sustained investment in actions to improve the natural environment, through the government as well as other sources
- Victoria's natural environment is fundamental to the cultural practices of Traditional Owners and Aboriginal Victorians
- how the actions are implemented will lead to increased empowerment to participate as equal partners with the State
- Victoria's natural environment is fundamental to the health and wellbeing of every Victorian

- landowners are generally likely to continue to undertake actions and maintain any improvements in the natural environment beyond initial funding
- protecting our natural capital will increase the resilience of key sectors of the economy
- when exposed to environmental concerns, the public will respond positively and support increased and sustained investment
- improved reporting by organisations and businesses on their environmental outcomes will lead to improved decision making and better biodiversity outcomes
- Victorians with a greater sense of connection to nature will act to protect it more and support increased and sustained investment
- there will be no event of a large enough scale to impact on achieving the targets
- while there will continue to be fluctuations and trends, there will be no major step change in climate over the implementation period
- mitigating threats to a species will, on balance lead to an increase in the persistence of the species
- the biodiversity sector, and policy and management processes are agile enough to respond to emerging issues
- a landscape scale planning approach, based on integration of representation of individual species needs, cost-effective actions and aggregation of areas treated, will deliver more successful outcomes and more resilient ecosystems than alternative approaches
- there will be no significant decisions to change land use over the implementation period, without consideration to the natural environment
- most endangered species will avoid complete extinction in some form, and the status of most vulnerable species will not worsen if sufficient threat management occurs
- response actions result in improved outcomes.

Victorians value nature model

Biodiversity 2037 recognises the central role that people play in protecting Victoria's natural environment for current and future generations. It highlights the legal rights and interests of Traditional Owners, their role in and authority for land management, cultural heritage and matters related to natural resource management.

A key goal of Biodiversity 2037 is having all Victorian's Valuing Nature (VVN), achieved through meeting a number of targets including: all Victorians connecting with nature, and five million Victorians acting to protect the natural environment. To achieve this goal, Biodiversity 2037 has multiple priorities around raising the awareness of Victorians about the natural environment, increasing opportunities for people to connect with nature including Traditional Owners connection to Country, and increasing opportunities for Victorians to act to protect nature. Biodiversity 2037 also aims to engage with community groups, non-government organisations, other partners and agencies and the broader Victorian community in acting to support biodiversity.

An underlying assumption of Biodiversity 2037 is that increasing the connections people have with nature will increase the value the Victorian community place on nature, which will increase community actions to support nature. Although there is some evidence for this, in particular contexts, Biodiversity 2037 will gain a deeper understanding of the linkages and drivers along the entire chain from Connect - Understand/Knowledge - Act – Biodiversity Outcomes, which will inform the actions government (and partners) could support to increase the likelihood of community value of nature increasing.

A conceptual model or framework that describes the general components of VVN and the relationships between people connecting with nature and acting to protect biodiversity will be developed. This conceptual model will not include all the complex interactions that need to be considered. Instead it will provide a starting point for Biodiversity 2037 to explore the components and links, and begin a conversation about definitions, pathways, relationships, drivers, motivations, knowledge gaps and key performance indicators. This will be further developed during the delivery of Biodiversity 2037.

There will be two main elements of the conceptual model: Nature and People. Biodiversity 2037 defines Nature very broadly as any green open space and water body that support living things, from highly modified areas through to pristine wilderness areas. Embedded within Nature is Victoria's natural environment, i.e. Victoria's biodiversity. This includes all of Victoria's diversity of natural ecosystems, diversity of native species and the diversity of genes within native species. These two components of nature are disaggregated for VVN because connecting with nature is much broader than acting to protect, with the latter only associated with the natural environment. The second main element of the VVN conceptual model is People. In the context of VVN, People are all Victorians across all sectors of the community.

Meeting the targets of Biodiversity 2037 requires implementing programs and initiatives that help facilitate Victorians connecting with nature, reduce barriers and motivate Victorians to act to protect biodiversity. Some programs may contribute to both targets, i.e. connecting and acting, while other programs may only contribute to one or the other. Actions to improve biodiversity may be direct or indirect. Direct actions are those that promote biodiversity directly, i.e. restoration of riparian zones by increasing native species richness and extent, versus indirect actions such as donations to a conservation group which are then used to do actions that promote biodiversity. The choice of initiatives to implement to meet the VVN targets of Biodiversity 2037 will depend on the degree to which the initiative influences connections with nature and how those connections motivate Victorians to act to protect biodiversity. These relationships form key questions within Victorian's Valuing Nature that will be explored and better understood through the implementation of Biodiversity 2037.

Healthy natural environment

DELWP's Strategic Management Prospects model supports the Healthy Environment goal by providing a comprehensive view of biodiversity values, threats, management actions and indicative management costs across Victoria. It can be used to identify the relative importance of natural values and the relative benefits of actions at places, and align local opportunities with state wide options.

In support of Biodiversity 2037, DELWP used the NaturePrint¹ project to build and bring together whole-of-landscape, fine-grain spatial information relevant to biodiversity.

A wide range of data including species, management observations, research insights, field mapping and remote sensing are brought together through shared digital systems. Maps are created by combining and extrapolating these data to provide consistent and comprehensive views across the broad areas relevant to biodiversity conservation. Habitat Distribution Models of many species (including the majority of terrestrial vertebrate fauna and threatened flora) are now available and are being continually improved. Models of threats have also been prepared, linked to species by their traits, and linked to indicative costs of treatment.

Information on the amount of improvement in response to action (i.e. benefit) is in early stages of development and has resulted in the introduction of a key performance indicator (KPI), Change in Suitable Habitat, and a method for creating the first version of these data. This KPI reflects net improvement for each species from sustained threat management over time.

Change in Suitable Habitat provides a practical KPI for estimating net improvement in the outlook for species from our management actions. Persistence of native species is the fundamental idea of conservation biology. It depends on the characteristics of:

- individuals (e.g. finding and competing for habitat, food, mates)

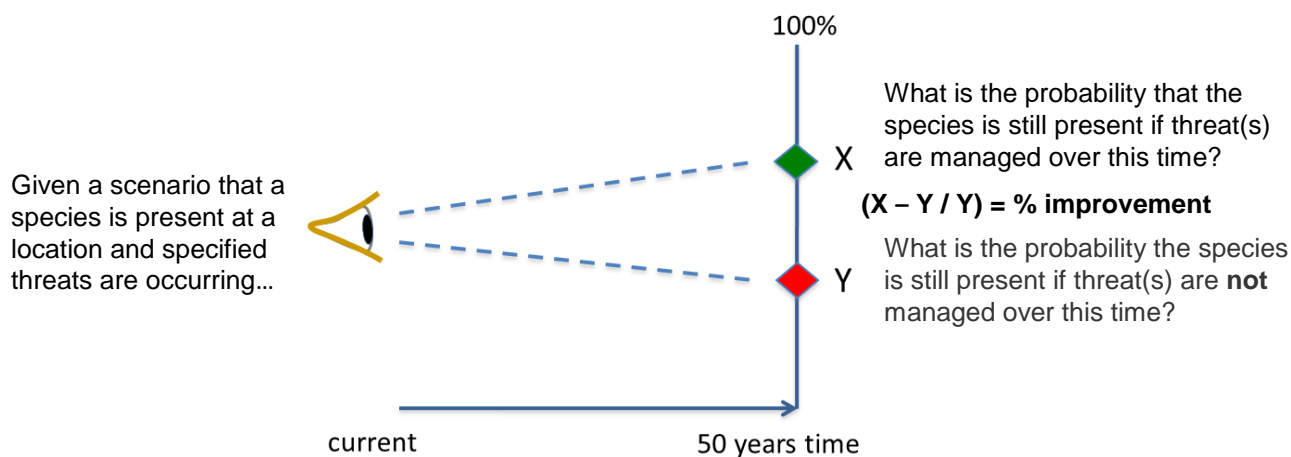
¹ NaturePrint is a suite of decision-support tools designed to help inform conservation planning and action to protect Victoria's biodiversity. It is based on a sophisticated and comprehensive analysis of biodiversity conservation needs that combines our best information about biodiversity values, threatening processes and ecosystem function at the landscape scale. NaturePrint provides a consistent basis to help us make better informed decisions in biodiversity policy options and operational decisions. NaturePrint is most developed for terrestrial landscapes, where the majority of decisions and actions occur, and will be progressively be expanded to include waterway and marine environments where appropriate.

- populations (e.g. recruitment and death rates, mobility, genetic diversity)
- ecosystems (e.g. disturbance regimes, interactions between species).

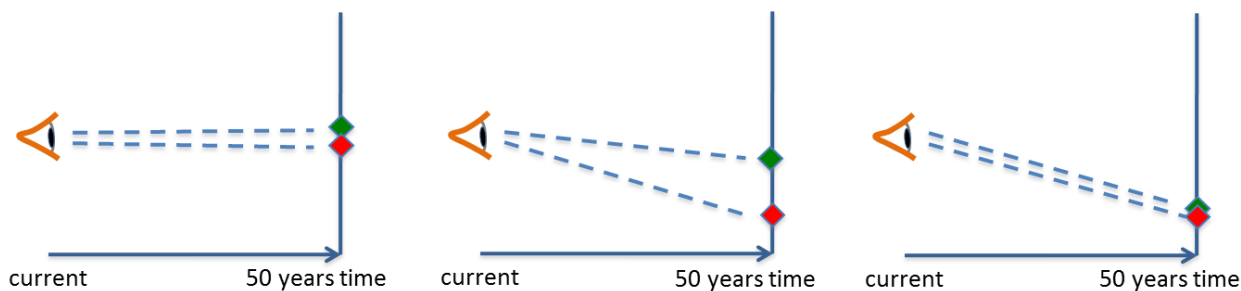
Although each of these characteristics can be described to some extent for some species, typically there are limited data, particularly for understanding the viability of populations. A practical measure of net improvement thus relies on habitat and threat information, often requiring extrapolation from available data. Like persistence or viability, improvement is a current estimate of the likelihood of future outcomes rather than a snapshot of the current situation. Since the purpose here is to consider what could most effectively be done to make things better, the measure is designed to capture the expected difference between action and no action.

Change in Suitable Habitat at the location level has initially been estimated by an expert elicitation approach. Experts were presented with threat and action scenarios for particular populations of species. The experts answered questions regarding the likelihood of that species still existing at the location if an action (or set of actions) was, or wasn't undertaken. Change is often slow, so the length of time used for estimating change (50 years) was chosen to be long enough to allow for a significant difference, but not so long as to make predictions too uncertain. Experts were asked for their confidence level around each estimate. Different scenarios were presented for different species, but also for the same species in different locations.

The data collected can be calibrated between experts, and in time with known actual situations. Due to the large number of species, threats and varied habitat contexts, experts addressed scenarios for a representative subset of species and contexts. Estimates were based on continuous, sustained management being delivered, over the 50-year time period. As depicted in Figure 5, the probability that species will still be present if sustained investment and management is supplied is **X**. However, if threats are **not** managed, the probability that the species will be present in the long term is **Y**. The difference between X and Y indicates the likely level of improvement. In the best-case scenarios, there is a significant positive change that is sufficient to deliver a reversal of a downward trend. However, there are also several scenarios that achieve less than this.



There is a range of expected change scenarios, for example:



Small improvement – the species maintains its presence at a location.
e.g. a common species that is resilient to predicted threats.

Significant improvement but the species is still declining.
e.g. a small mammal responds well to predator control but small population size is still a threat.

No improvement – no effective treatment of predicted threat.
e.g. a rainforest fern that is sensitive to drying under climate change.

Figure 5: Estimates of the likelihood of species persistence

Based on this elicited data, trait-based modelling was used to infer across all species, extrapolating information regarding the response of species to different scenarios to other species with similar traits (Figure 6).

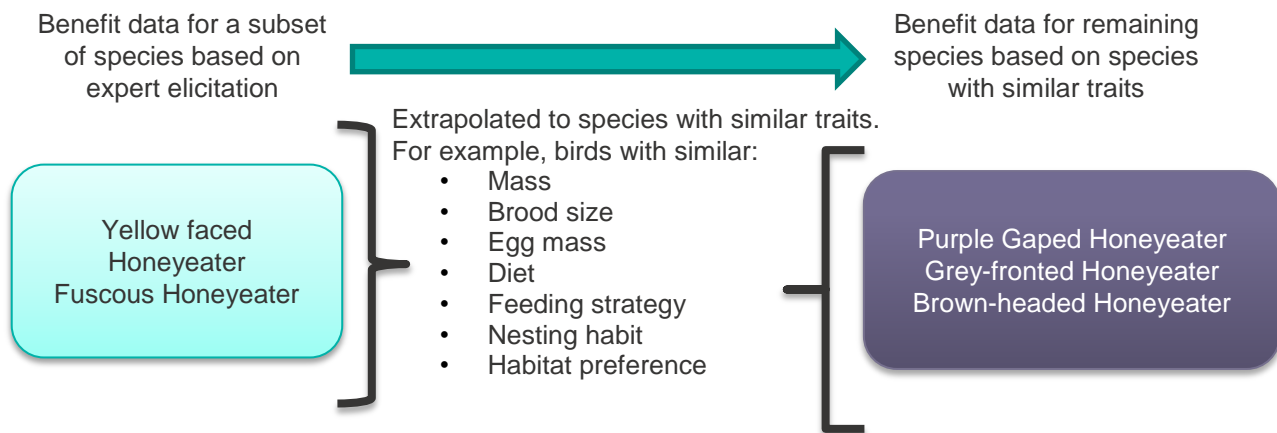


Figure 6: Example of extrapolating response information

Current data on Change in Suitable Habitat focuses on treatment of common widespread threats or actions (e.g. invasive species, revegetation) with the expectation that further actions, particularly those requiring direct manipulations to improve adaptation to climate change (e.g. translocations, genetic strengthening) will be progressively assessed using this measure.

Since the KPI is applied in an equivalent manner to different species as well as scenarios, this provides an essential contribution to thinking about how to maximise benefits across all species (see next section).

Information on broader context is generally captured in the earlier stages of development: models showing habitat rarity, depletion, connectivity and vulnerability exist, and are being actively improved; models of fire and water behaviour exist, and analyses are being expanded to look at regimes and future scenarios; information on communities of interest and partnership opportunities is generally based on a variety of qualitative data that is currently less suited to comprehensive analyses.

Next steps

1. Develop a Victorians Valuing Nature model to describe our understanding of the drivers and barriers to people connecting with, acting for and valuing nature including Traditional Owner rights and wellbeing through connection to Country and the relationship with delivering actions for biodiversity. This will also help in the identification of key performance indicators for this goal (Biodiversity 2037 Implementation Framework – Action 3.1)
2. Continue the development and refinement of the Strategic Management Prospects model to include other environmental aspects and management techniques and their cost
3. Work with Traditional Owners to identify cultural gaps in the Strategic Management Prospects model related to consideration of cultural values, locations and management practices and how they may be incorporated into the model as appropriate to influence on-ground actions and facilitate reporting on actions
4. Increase the accessibility to the underlying features and data of the models, and enable feedback and improvements in this information.

Measuring progress against performance targets

Victoria's natural environment is richly diverse, unique and precious. Victorians treasure the environment not just for its own sake, but for its indispensable value to individuals, communities, Aboriginal Victorians and society as whole. Biodiversity 2037 recognises this and presents a vision for Victoria's biodiversity, supported by two goals. The first goal, ensuring that individual Victorians value nature highly, is to be pursued in parallel with (and in support of) the second goal, a healthy environment.

Biodiversity 2037 identifies key performance indicators (KPIs) and state-wide targets for both goals and outcomes, noting that further work will be developed to establish contributing targets particularly related to the Victorians value nature goal. The KPIs capture the intent and aspirations of the goals and provide transparency and accountability for progress, in the context of available information. Measuring progress against these KPIs in achieving the targets set out in Biodiversity 2037 will provide transparency and ensure accountability to the community

To strengthen accountability, each land or water manager will report standardised output data for their actions to a state-wide storage system. This will include actions due to different formal 'transactions' or decisions (i.e. approval of vegetation clearing or investment decisions) resulting in losses and gains. The output data will feed into the series of nested KPIs, and hence measure progress towards the state-wide targets.

Some managers may commit to projects and deliver actions that are not a state or area biodiversity priority or may be funded through other programs, but will still be recognised and accounted for in reporting on progress towards targets. These contributions include a number of government programs which may not have biodiversity as a primary objective, but do provide significant benefits for biodiversity and people connecting to nature and will still be able to demonstrate their contribution to the targets (e.g. health programs, nature tourism, the *Water for Victoria* plan).

Key performance indicators

The KPI, together with their measure of assessment, baseline and target are set out in the table below. Appendix 1 provides specifications for data collection and analysis against each of the KPI.

Table 1: Key performance indicators

Indicator	Measure	Baseline	Target
Goal	Victorians value nature		
To be identified through development of Victorians value nature model			
Outcome	By 2037, all Victorians connecting with nature		
To be identified through development of Victorians value nature model			
Outcome	By 2037, five million Victorians acting to protect the natural environment		
To be identified through development of Victorians value nature model			
Outcome	By 2037, all Victorian Government organisations that manage environmental assets contribute to environmental-economic accounting		

Indicator	Measure	Baseline	Target
To be determined			
Output	Build on existing and create new opportunities for Victorians to connect with nature, and act to protect the natural environment		
Connecting to nature	<p>To be identified through development of Victorians value nature and Standard Outputs review. Examples -</p> <p>Number of engagement events</p> <p>Number of publications</p> <p>Number of Traditional Owner led biocultural events</p>		
Acting to protect the natural environment	<p>To be identified through development of Victorians value nature and Standard Outputs review. Examples -</p> <p>Number of Traditional Owner and Aboriginal Victorian participants in actions</p> <p>Number of volunteers and number of hours volunteering</p> <p>Number of citizen scientists</p> <p>Number of people participating in biocultural learning programs</p> <p>Number of management agreements</p> <p>Number of jobs</p> <p>Number of participants in on-ground projects</p> <p>Number of field days etc.</p>		
Contributions to Environmental Economic Accounts	<p>Number of Victorian Government organisations that manage environmental assets that contribute Standard Output data</p>	TBD	100% of Victorian Government organisations that manage environmental assets contribute Standard Output data
	<p>Number and type of businesses that are engaged in considering their impacts on natural capital relevant to their business</p>	TBD	TBD
Goal	Victoria's natural environment is healthy		
Change in Suitable Habitat for species	(On average) % Change in Suitable Habitat in 50 years for threatened species	0	(On average) a 100% net positive Change in Suitable Habitat in 50 years for threatened species.
Outcome	By 2037, no vulnerable or near-threatened species will have become endangered		
Species conservation status	Number of species with changes in conservation status	0	0 vulnerable or near-threatened species have increased their

Indicator	Measure	Baseline	Target
			listing to endangered by 2037
Outcome	By 2037, all critically endangered and endangered species that have at least one option available for being conserved ex-situ or re-established in the wild (where feasible under climate change) should they need it		
Options available for re-establishment of species in the wild where feasible under climate change	Number of species with options available	TBD	100% of critically endangered and endangered species have at least one option available for being conserved <i>ex situ</i> or re-established in the wild (where feasible under climate change) should they need it by 2037
Outcome	By 2037, there will be a net gain in the overall extent and condition of habitats across terrestrial, waterway and marine environments		
Habitat extent	Annual rate of change (ha per year) and yield (e.g. habitat hectares per year) of terrestrial, waterway and marine habitats (site specific) Annual rate of change (ha per year) and yield (e.g. habitat hectares per year) of terrestrial, waterway and marine habitats (broad scale)		
Habitat condition	Annual rate of change (ha per year) and yield (e.g. habitat hectares per year) of terrestrial, waterway and marine habitats (site specific) Annual rate of change (ha per year) and yield (e.g. habitat hectares per year) of terrestrial, waterway and marine habitats (broad scale)		
Output	Establish and maintain sufficient amount of key management regimes in priority locations to deliver the outcomes		
Herbivore control	Hectares of herbivore control in priority locations		4 million hectares of herbivore control in priority locations by 2037
Pest predator control	Hectares of pest predator control in priority locations		1.5 million hectares of predator control in priority locations by 2037
Weed control	Hectares of weed control in priority locations		1.5 million hectares of weed control in priority locations by 2037
Restoration	Hectares of revegetation in priority areas for connectivity between habitats		200,000 hectares of revegetation in priority area for connectivity between habitats by 2037
Protected area	Hectares of new protected area on private land		200,000 hectares of new protected area on private land by 2037

Next steps

1. Through the development of the Victorians value nature model, identify KPIs for this goal and related outcomes
2. Review and update DELWP standard outputs to ensure they cover all relevant activities for Biodiversity 2037 and enable required disaggregation and provide appropriate data to enable analysis and reporting of the contribution of each organisation and project to achieving the biodiversity outcome targets (Biodiversity 2037 Implementation Framework – Action 17.5)
3. Review and update biodiversity management standards (including revegetation standards which will include adaptation for climate change) and translate into an easy to use format
4. Complete baseline data for each KPI (Biodiversity 2037 Implementation Framework – Action 20.4), and identify how data may be disaggregated for reporting for example by Traditional Owner Country boundaries, cultural practices and cultural values, catchments, organisations etc.
5. Develop an approach to calculating Net Gain across terrestrial, waterway and marine habitats (Biodiversity 2037 Implementation Framework – Action 17.10)
6. To support Net Gain reporting, in partnership with Traditional Owners investigate the use of the Aboriginal Waterway Assessment tool for monitoring and reporting change in the condition of habitats, as well as its expansion to include assessments of terrestrial and marine habitat
7. To support Net Gain reporting, complete gathering and synthesis of all historic data to map and classify Victoria's marine habitats using the new Combined Biotope Classification Schema (CBiCS).

Improving effectiveness through new knowledge

Driven by the need to improve decision making, adaptive management implicitly requires knowledge of how ecological systems and their biota are changing as a result of management actions or cultural practices. It is impossible to know whether a management regime (including cultural practice) or intervention is effective or sustainable, and how to adapt it for improved outcomes, without knowledge of how it affects the biota through time.

Research projects have an important role in the context of implementing a long-term, state-wide biodiversity plan. They often involve a more intensive investigation over a larger spatial scale and potentially a longer time-frame of particular management actions or cultural practices, knowledge of species (e.g. behaviour/habitats), changing land uses and threats and their interaction and drivers and barriers to behaviour change. A combination of large-scale, well-designed studies of particular management activities and responses can be complemented by local intervention monitoring in particular regions, again with attention to objectives, study design and systematic data collection.

Advantages of such research projects include:

- greater capacity to investigate the outcomes of different aspects of a management regime (e.g. variation in intensity, frequency, and scale of management)
- greater capacity to understand and compare outcomes for a range of different responses (habitat features, vegetation structure, soils, carbon etc.)
- opportunity to test and compare the outcomes of management across different systems (e.g. different vegetation types, or habitats) and achieve greater generality of understanding.

This requires careful problem definition and an appropriate study design and may include a selection of sites across the landscape including links to current management projects.

Validation of responses and predicted intervention outcomes

Research projects that are effective, including both local-scale intervention monitoring and large-scale investigations, have a number of common characteristics.

A conceptual model - A simple conceptual model is necessary to portray how a particular threat and associated management action are likely to affect different components of the system. Such models can show diagrammatically the relationships (cause and effect) between different components and summarise current knowledge (and the strength of this knowledge) and uncertainties.

Clearly defined questions and objectives - Identifying (and documenting) one or more key questions is essential to provide focus for the project, and for planning the study design. Questions will logically arise from developing the conceptual model of the system.

A sound project design - The design must have core elements that help ensure that unambiguous results can be obtained. These elements include the need for 'controls' for comparison with management treatments; adequate replication of study units; sampling in a consistent manner and time; and a study duration relevant to meeting the objectives.

High quality data – Data, whether it is quantitative ecological field data or qualitative data such as conversations, behaviours or cultural knowledge, must be collected in a consistent manner using appropriate techniques, be recorded accurately, and stored in a relevant database with appropriate documentation. The value of such data will be greatly enhanced if it is archived so that it can have a longer-term legacy and use beyond the immediate project.

Analysis and reporting - For data to provide information and knowledge, they must be carefully collated and analysed in relation to the initial questions and objectives of the project. These outcomes must then be communicated in an appropriate form to partners, stakeholders, managers and wider community.

Effective leadership and partnerships - Effective leadership, oversight and accountability is required to ensure that each stage of the project is carried out consistently, reliably and rigorously. Partnerships between policy makers, project managers, scientists and community are important to bring together complementary expertise and insights and to enhance 'ownership' of outcomes.

Two main kinds of approaches are commonly used for measuring predicted intervention outcomes.

Manipulative ‘management experiments or trials’ – are those that involve a comparison between study sites that experience a deliberate management intervention and ‘control’ or ‘reference’ sites at which the intervention is not undertaken. Such studies are most effective if the target biota or group (species, vegetation etc.) are measured ‘before’ and ‘after’ intervention in both the manipulated and reference sites.

This same method can be used to test assumptions and measure impacts on behaviour change interventions. Studies could include existing or new pro-environmental behaviour change programs (e.g. education programs) or single one off interventions (e.g. campaigns).

Natural experiments – are based on selecting study sites that are environmentally similar but have experienced different types or levels of an intervention in the past. This approach is commonly used to evaluate the outcomes of management over longer periods of time (decades or more), and is termed a chrono sequence approach, or ‘space for time’ substitution. For example, this approach could be used to compare the long-term outcomes of revegetation for faunal communities, by selecting a series of sites that represent different ages of revegetation from 1 to 50 years of age. The fauna (and habitat structure) are measured at all sites in the same consistent way, and differences are assumed to be attributable to the different treatments (i.e. age of revegetation) and/or measured environmental covariates.

These approaches can also be applied to testing the outcomes of interventions on behaviour and attitudinal change in people as well as changes in the environment. Other approaches such as meta-analysis of research findings from a number of previous projects, grey literature or published papers may also be used.

Management processes that impose long-term changes in the environment (such as planned burning, timber harvesting, riparian restoration) and long-term pro-environmental behaviour change will likely require a combination of both manipulative experiments and natural experiments to track changes through time in the rate and extent of recovery and change in pro-environmental behaviour.

Where it can be done in a rigorous manner, projects should be built around the concept of ‘management experiments or trials’ that involve practical, on-ground management actions. Careful consideration should also be given to a ‘coordinated distributed experiment’ approach, such that replicate study sites and treatments are distributed across geographic regions. This has benefits from integrating across regions (rather than duplicating in each region), and testing outcomes across a wider geographic gradient. Where possible, on-ground projects being implemented through Biodiversity 2037 may be designed and undertaken to provide study sites so that management and research can be complementary.

Validation of modelled assumptions of ecological knowledge and processes

There is an on-going demand for new knowledge to underpin both management activities and strategic conservation planning as well as to respond to changing human land-use and environmental impacts (including those not yet known). There are many gaps in our current conceptual understanding and models, and new challenges will emerge that require improved ecological knowledge of species, ecosystems and ecological processes.

Ecology and conservation of species of concern - This includes (but not restricted to) threatened species, species of cultural value and over abundant or out of range native species, the processes that determine their distribution and abundance, and their response to land use and conservation management. ‘Genetic rescue’ of threatened species is an example of a newly emerging field of investigation to enhance practical conservation management.

Land-use change and scenarios for the future - Land-use change and environmental change continue to impose new pressures on conservation: for example, peri-urban expansion, extended drought, increased wildfire, and climate change). For conservation planning to be pro-active and to anticipate change (rather than being reactive) over the period of Biodiversity 2037, it is essential that we understand the potential implications of future change, for example:

- the primary and secondary effects of current and emerging land-uses
- the impacts of multiple and synergistic pressures on the environment (e.g. fire, habitat loss, herbivory, predation and changing climate)

Ecosystems and ecosystem services - While nature conservation typically focuses on species of plants and animals, the context for their conservation is the ecosystem in which they occur. Likewise, it is ecosystems that provide many of the services that sustain human society (clean air and water, productive soils). We need to understand how particular ecosystems function (e.g. ecological interactions and biophysical processes) and the factors that sustain or deplete the services that nature provides to humans. These matters are relevant both to 'people connecting with nature' and 'healthy environment' themes in Biodiversity 2037.

Human dimensions of nature conservation - Understanding the motivations and barriers of different sectors of the community, what influences their behaviours, what will motivate people, and the most effective ways to engage with the community.

Next steps

1. Develop a paper which describes different types of models (both spatial and decision support models), their use, limitations and benefits

Monitoring emerging trends

The Victorian environment and its flora and fauna have changed markedly over the last 100 years, and further changes will occur in coming decades. We can anticipate emerging trends in the status of plants and animals, in the structure of ecological communities, and in the function of ecosystems in Victoria, caused by:

- changes to existing land-uses and other pressures (e.g. exotic species)
- climate change
- single events that have long-term impacts (e.g. drought, bushfire)
- new land uses (e.g. new rural industries)
- changes from as-yet unforeseen drivers
- interactions between two or more of these individual causes.

We need to know how, where, and why Victoria's flora and fauna, and the habitats they occupy, are changing through time. Such knowledge is a fundamental basis for effective conservation and management. The risks of not knowing the impacts of such changes include an inability to detect 'early warning' signs of species decline or impending extinction, a limited capacity to predict the outcomes of future climate scenarios, and inadequate knowledge of when and where management intervention is required.

To detect emerging trends in biodiversity requires longitudinal data – data systematically collected over time. Typically, the abundance or distribution of species varies from year to year. It is only by careful monitoring over the longer term that sustained patterns become evident. To detect and respond to emerging trends, we need to know:

- the direction and rate of change through time for biodiversity measures of interest, such as the abundance of species, the composition of plant or animal communities, changes in functional relationships, or the geographic distribution of species
- where, and how widespread, such change may be (e.g. a single bioregion or across many bioregions)
- potential 'trigger points' at which intervention or further action is required
- the likely causes of change to be better able to target responses.

Two main types of projects contribute to detecting and identifying emerging trends. First, projects that focus on a particular ecosystem (e.g. wetlands, alpine), a particular location, or on particular taxa (e.g. a threatened species, shorebirds) can provide long-term data on trends for that system or taxa. Often, such projects have been established to address conservation issues or research questions, and so the design allows detailed investigation of factors associated with changes in the status of target species or biodiversity attributes.

A second type of project is broad-scale monitoring, also question driven, that systematically assesses the status of species or biodiversity attributes across large scales, from bioregions to state wide. Such large-scale monitoring provides essential information not possible from more localised projects: for example, overall trends for a species across its range, differences in trends in different ecosystems and bioregions, and responses to large-scale drivers and pressures such as rainfall or climate change.

The primary purpose of monitoring emerging trends is to detect and understand biodiversity change in order to respond in an effective manner when problems are identified. If the cause of change is apparent, an effective response may involve on-ground intervention such as modification to land management or cultural practices, actions to enhance habitat quality, protection of important refuge habitats, or translocation and captive breeding. If the cause of the trend is not clear, then it can be prioritised for targeted research (see Improving effectiveness) to determine where and how intervention will be most effective.

While the benefits of monitoring emerging trends are clear, the practical challenge is the resources required to implement such programs and sustain them through time. Given this, in the most realistic prospect for success is developing a collaborative approach among Government agencies, researchers and other groups, where possible building on existing infrastructure and knowledge base of such studies. It will also be necessary to identify gaps and foster additional projects to address priority issues.

An essential component to link biodiversity research and monitoring with conservation outcomes is effective communication and reporting. It is critical that such time-series data are collated and carefully analysed in a timely manner to document the nature of any emerging trends (e.g. their direction, rate) and the factors influencing them, so that they can be communicated and acted upon

Next steps

1. Establish a sector-wide collaboration or community of practice with partners across Victoria to harmonise and promote monitoring of emerging trends in biodiversity, integrating and coordinating across existing monitoring projects. The collaborative group should
 - establish operational approaches to working together over the long term, securing funding, sharing information, data standards and storage and communicating trends
 - identify key issues, pressures and impacts to be monitored and develop a shared understanding of existing projects that address these issues, and any gaps.

Measuring direct change at a project scale

It is not necessary or possible to measure the outcomes of every individual management action, but it is essential that for *each type of action* there is an adequate understanding of the relationship between the management intervention (including its scale, intensity, duration) and its outcome. This is necessary to ensure that management undertaken is evidence-based, and to refine the prioritisation of management actions to achieve conservation outcomes.

Projects to measure management outcomes can be undertaken at different scales: they may relate to management actions, threats or change that commonly occur across much of the state; or they may relate to specific local actions.

Local scale projects involve but are not limited to measuring the change in the environment (particular species, habitats, or vegetation communities), changes in people's behaviour or wellbeing, use of citizen science or ability to undertake cultural practice, in response to specific management actions at a specific location.

Measuring the direct change resulting from particular activities or action learning projects offer other advantages, including:

- linking outcomes with specific actions within a specific environmental context
- targeting of particular species or vegetation types that are limited in distribution
- fostering stronger connection between threats, management actions, outcomes and land managers
- re-vitalising knowledge of managing Country by Traditional Owners
- opportunities for community education and local 'ownership' of conservation management
- greater potential to be sustained by local 'champions'.

The key challenge for such projects is to ensure that they are well designed and implemented. Access to scientific advice and support, and clear accountability for implementation, are necessary components. The key characteristics for study design described in the research section above are also applicable to these projects.

Where funding provided through State Government biodiversity initiatives includes a local scale monitoring component, the project will develop a targeted MER Plan (based on a template provided), aimed at tracking, evaluating and communicating progress towards the project objectives. The monitoring efforts will be tailored around objectives developed for that location and project, but consistent approaches and standards should be applied to ensure findings can also be evaluated and reporting aggregated with other projects to create a state-wide scale if desirable.

These intervention monitoring projects will be complemented by:

- the Riparian and Wetland Intervention Monitoring Programs, aimed at evaluating the effectiveness of riparian and wetland management, with a focus on the priority waterways identified in Water for Victoria and the Ramsar convention
- the Victorian Environmental Flows Monitoring and Assessment Program (VEFMAP)
- the Wetland Monitoring and Assessment Program for environmental water (WetMAP)
- intervention monitoring projects through the Victorian Bushfire Monitoring Program (VBMP).

Next steps

1. Develop an MER template for local scale monitoring projects including action learning projects
2. Develop monitoring standards

Investing in improving knowledge

Investment in research, improving effectiveness, monitoring emerging trends and data collection will be prioritised through a systematic approach to understanding the risks that knowledge gaps and uncertainty may have on Biodiversity 2037 in achieving its outcomes and goals. The changing nature and scale of both private and public investment in native habitat restoration and reconstruction, and in flora and fauna management, demands a coherent approach to address this deficiency.

The approach will provide a strategic view of priority areas for investment in research, monitoring and data collection, complemented by processes to allocate, co-ordinate and leverage funding to research projects that address these priority areas (Biodiversity 2037 Implementation Framework – Action 2.1).

Strategic prioritisation

Biodiversity Knowledge Framework

A Biodiversity knowledge framework will be developed to identify data, research, monitoring and information synthesis to inform policy, management, and reporting.

Guided by a review of information requirements to support biodiversity policy, programs, on-ground management and decision support models, this process may include:

- undertaking a stocktake and reviewing existing models such as Strategic Management Prospects model), Population Viability Analyses, etc.
- reviewing available logic frameworks for Victorian biodiversity policy and programs and identification of information requirements to support them
- updating or developing conceptual or integrated models for biodiversity values or threatening processes where there are no relevant existing models e.g. ecosystems, functional species groups. This may include documenting the predictions of experts concerning responses to management.
- undertaking a stocktake of existing programs monitoring emerging trends and other data collection
- reviewing reporting requirements for biodiversity policy and programs e.g. BP3 measures, Take2 commitment, MERI framework for Climate Change Adaptation etc.
- investigating information needs to undertake a value for money comparison across programs and mechanisms
- workshops with policy and program staff, on-ground managers and topic experts.

Investment mechanisms

Knowledge investment undertaken by a range of organisations such as state government portfolio agencies and tertiary institutions may be delivered through a variety of mechanisms. These mechanisms and the circumstances when it is suitable to use each type of mechanism will be identified. This may include:

- co-invested collaborative projects (between organisations including research, educational, Traditional Owner and not for profit organisations)
- investment in ARC-linkage grants
- post-graduate student projects
- open calls for projects
- select tender
- commissioning research
- in-house research capability
- inclusion in requirements or standards for grant recipients etc.

Prospectus of priority knowledge requirements

A prioritisation approach will be developed to help to identify how knowledge gaps, or deficiencies, impact the implementation of Biodiversity 2037 and other programs progress towards targets, and inform research investment-decisions so that they are strongly accountable to the needs of Biodiversity 2037, and responsive to change.

This approach will analyse the risks (e.g. of making poor decisions) associated with the uncertainties which includes consideration of the likely level of impact the improved knowledge would have on management actions, and how commonly it is undertaken.

A prospectus which includes a prioritised list of knowledge requirements will be produced.

Investment decisions

Investment decisions, utilising the prioritised knowledge gaps and uncertainties identified in the Biodiversity Knowledge Framework may occur through two processes:

Forums –forums that enables a collaborative approach between researchers to plan projects that contribute to priority research and monitoring topics, considering organisations' existing intentions and/or commitments, and identify potential new projects that are co-designed through the forums. This will help build collaboration, improve alignment of actions, discuss trade-offs and select projects that have the greatest chance of making a measurable improvement.

Call for proposals – a call for proposals (generally for small grants such as post-graduate 'top-up' grants, small research grants, local scale monitoring projects etc.) that respond to a list of prioritised research topics.

Reviewers will be engaged to review the design and outcomes of research projects funded through State Government biodiversity initiatives to ensure they are appropriate and effective in responding to, and answering the key questions.

Next steps

1. prepare the biodiversity knowledge prospectus

Role of citizen science

Increased systematic and consistent data collection over long timeframes and across broad landscapes will require sustained input by many people.

Biodiversity 2037 envisages inviting citizens to have a greater role in biodiversity protection as citizen scientists. Filling knowledge gaps and monitoring progress are two key roles that citizen scientists can play. Citizen science offers the scope to involve enough people in collecting MER data across the landscape and for time periods that can extend beyond typical project lifespans.

Many citizens are already collecting long term surveillance monitoring data, such as tracking fish species found on Victoria's reefs and assessing the status of birds in Victoria's woodlands. These types of case study examples at local scales (e.g. long-term change in a threatened bird species) are important for building a wider understanding of regional change in the environment. Citizen scientists comprehend that understanding change in ecosystems can require monitoring over lengthy ecological cycles.

Citizen scientists can support the MER Framework through, for example:

- monitoring species and populations and the effect of management actions at significant biodiversity sites (e.g. recoding fish catch data at sites that receive environmental water)
- tracking the level of connection Victorians have to nature, the actions taken (and barriers) to protect nature.;
- following transformation in ecosystems due to disturbances such as fire and climate change;
- collating historical data.

Networks of citizen scientists will be encouraged to play a role in MER, using established protocols and standards, and with training and support provided. A platform for flexible input, collation and reporting of citizen science data will be developed.

Direct involvement in MER provides an opportunity for citizens to connect to nature, learning about the status of biodiversity and the actions required to protect it, and understand the advances and setbacks. Data sharing allows individuals to gain a greater appreciation of the wider picture beyond the confines of a local environment.

Reporting

Sharing outcomes and progress against goals of Biodiversity 2037 with the community provides the opportunity to further build awareness and connection with Victoria's rich biodiversity, celebrate successes, and encourage further participation in acting to protect nature.

Biodiversity 2037 will be supported by a rolling implementation schedule, beginning with an initial four-year Implementation Framework that will outline the actions to be taken in the early phase of delivery. For transparency, DELWP will prepare a report after two years of implementation to update the public about progress of these activities and to help inform the development of the implementation schedule beyond the initial four-year framework.

The Commissioner for Environmental Sustainability Victoria will report on progress against the performance targets as part of the State of the Environment reporting. The next report will be in early 2019 and although only a short time into the implementation of Biodiversity 2037 will provide an opportunity to establish and align requirements as well as demonstrate initial progress. The State of the Environment reporting will transition to digital reporting in the longer term, which provides the ability for more regular updates on progress than the 5-yearly reporting cycle provides.

A core element required to measure the progress of Biodiversity 2037 is the contribution by partners of their activity (output) data – where the activity occurred, what was undertaken and to what standard. This data is an increasingly common standard utilised across a range of natural resource management programs in Victoria. Consistent collection and sharing of this data by each organisation will enable a range of reporting, including that required for Biodiversity 2037. For example, reporting on implementation of policies and regulations, reporting against catchment strategies or Country plans and the annual achievements of an organisation. Data collected through the MERF will be available through the data management systems described in this document. Consent or permission may be required for some data (e.g. species with sensitive requirements).

Evaluation of Biodiversity 2037

The government is committed to evaluating the success of Biodiversity 2037 over the next twenty years to ensure that biodiversity outcomes are continuously improved and that implementation of Biodiversity 2037 is designed and delivered efficiently and effectively. The Victorian Government will conduct an evaluation of the implementation of Biodiversity 2037 every five years. The evaluation will look at:

- organisational arrangements accountable for ensuring that a program of activities is undertaken effectively and successfully
- strategic planning and processes that set direction, assign priorities and provide leadership for Biodiversity 2037
- mechanisms for coordinating the efforts of different agencies (and divisions within agencies), organisations and groups to work together in an effective and complementary manner.

Answering these questions will allow refinement and improvement of approaches to ensure that the best methods for meeting the goals and targets of Biodiversity 2037 are adopted. To support transparency and accountability, the government will publish the findings of these reviews. The five yearly review, together with the reports on progress towards the targets will support review of the Biodiversity Plan after 20 years of implementation in 2037.

Information discovery, data capture and management

Information discovery

Easy access to biodiversity information, tools and data to support a wide range of community, partner and stakeholder needs will be provided via the Biodiversity Information Portal.

The Portal will make it easier for people to find information about where plants and animals live and the characteristics of their habitat in terrestrial, freshwater and marine environments. There will be a greater emphasis on choosing an area of interest and extracting reports on species, habitats and actions. While it is map-based it will be report focussed, rather than turning map layers on and off to understand an area. It will aim to guide users to appropriate information for answering important questions, rather than presenting the layers of data that DELWP has.

Access to decision support tools such as Strategic Management Prospects, the models that underpin this and to data capture tools will be provided via the portal to improve understanding and use of these tools, and enable feedback and improvements in this information.

Data capture and management

A range of DELWP managed state-wide systems will be used directly in the implementation of Biodiversity 2037 and in determining the effectiveness of its implementation. These systems provide the data used to develop and subsequently improve modelling that supports investment decision making. Their consistent use improves the accuracy of models and provides a reliable record of investment over time. Many of these systems are increasingly using maps to record and display biodiversity assets and management activities.

Field data collection and easy transfer of that data to the appropriate system(s) aim to improve the ease and ability of contributing data to these system(s) resulting in improved quality and availability of information for those collecting the information as well as those using the information. DELWP will work to ensure an easy to use interface to allow relevant data stored in other systems such as those maintained by Parks Victoria, Catchment Management Authorities or Traditional Owner Corporations to be transferred into DELWP systems to provide a single source of truth and enable analysis.

Standard outputs tool.

A web-based mapping tool will be released for recording outputs (goods or services) resulting from the delivery of on-ground activities undertaken to conserve and manage Victoria's natural environment. The tool will apply the DELWP 2015 published standards (DELWP Output Data Standards ('standard outputs')) for reporting the range of environmental goods and services that DELWP invests in through a range of environment investment programs across terrestrial, freshwater and marine environments.

The tool will store activity data over time for use in reporting, due diligence and for better investment and natural resource management planning decisions. Information from the tool will feed into analysis and models, and will contribute to improving Strategic Management Prospects.

Victorian Biodiversity Atlas

The Victorian Biodiversity Atlas (VBA) is a foundation dataset of distribution and abundance information for all Victorian species and is the checklist of both plant and animal names and conservation status. The VBA is both a database and a web-based application that allows people to access, manage, share and report on species observations. A new mobile platform is being developed to help more people to contribute species records more easily.

Species observation data from the VBA are used as inputs to other DELWP biodiversity information tools and datasets including species distribution and importance models, strategic biodiversity values, strategic management prospects, and ecological vegetation types.

Marine data library

The marine data library will store primary marine, estuarine and coastal data sets from monitoring programs in their native formats, and assemble relevant components of that data into the VBA (for species occurrences) and the Biodiversity Information Portal (for spatial representation of monitoring programs).

STAR

The Spatial, Temporal Activity Recorder (STAR) is a web-based project management tool used for recording detailed plant and animal management activities under a range of DELWP investment programs. Users record and view the “what, where, when, how, why and who” involved in managing projects and activities using both forms and maps. STAR is principally for recording animal and plant management (pest animals, overabundant wildlife and native species, weeds and overabundant or out of range native species), from planning to completion and can be used to demonstrate (plant and animal management) regulatory compliance.

Output information from STAR will be provided to the Standard Output Tool and will feed into analysis and models, and will be incorporated into Strategic Management Prospects. Data and maps generated from STAR can be used for due diligence, environmental planning, regulatory compliance and reporting.

Appendix 1 Key Performance Indicators

KPI: Change in Suitable Habitat

	Approach
<p>Indicator</p> <p>Change in Suitable Habitat (CSH)</p> <p>Target</p> <p>(on average) 100% net positive Change in Suitable Habitat in relation to a no management scenario</p> <p>Baseline</p>	<p>This indicator considers how current circumstances, climate change futures, and histories of depletion should influence our choices about where to act and manage. Persistence of native species is the fundamental idea of conservation biology. It depends on:</p> <ul style="list-style-type: none"> the characteristics of individuals (e.g. finding and competing for habitat, food, mates); the characteristics of populations (e.g. recruitment and death rates, mobility, genetic diversity); and The characteristics of ecosystems (e.g. disturbance regimes, interactions between species). <p>Although each of these characteristics can be described for some species, typically there is limited quantitative data, particularly for understanding the viability of populations. A practice indicator of net improvement is reliant on habitat and threat information, often requiring extrapolations from available data. Since the purpose here is to consider what was done to make things better, the measure is designed to capture the expected difference between action and no action.</p> <p>Change in Suitable Habitat is the increase in the likelihood that a species will persist at a location at a future time (e.g. 50 years) in response to sustained management of relevant threats expressed as the proportional increase in hectares of Suitable Habitat a species has received under a sustained management regime, compared with no management. Change in Suitable Habitat can be calculated across the range of a species and can be combined across many species, places or actions.</p> <p>Actions and their interpretation will be based on the data used in the KPIs below (standard output data and delivery standard). Each analysis will be recalibrated based on updated models. Any sites where there is evidence that works have not been maintained will be removed from future analyses.</p> <p>Data can be disaggregated by threatened species, species of cultural value to a Traditional Owner group, Traditional Owner Country boundaries, catchment etc.</p>

KPI: Species conservation status

	Approach
<p>Indicator</p> <p>Species conservation status</p> <p>Target</p> <p>0 species change status to endangered in relation to the status assigned in initial review of species using the Common Assessment Method (2018?)</p> <p>Baseline</p> <p>0 species</p>	<p>This indicator will report on the number of species that become endangered following the initial review of species status using the Common Assessment Method.</p> <p>Reporting will commence following re-classification of all species using the Common Assessment Method, likely to occur in 2018.</p> <p>Following the initial review, species status will be subject to ad hoc periodic review either through the provision of new information, or nomination processes calling for a review of the classification. Should a species become endangered, reporting will seek to identify whether the change in status is a result of better information or an actual decline in the species</p>

KPI: Options available to critically endangered or endangered species for being conserved *ex situ* or re-established in the wild (where feasible under climate change) should they need it

Approach	
<p>Indicator</p> <p>Options available for being conserved <i>ex situ</i> or re-established</p> <p>Target</p> <p>100% of critically endangered and endangered species that have at least one option available for re-establishment in the wild where feasible under climate change</p> <p>Baseline</p>	<p>This indicator measures the per cent of all species listed as critically endangered or endangered that have options for being conserved <i>ex situ</i> or re-established in the wild (where feasible under climate change) should they need it.</p> <p>Reporting will commence following re-classification of all species using the CAM. A review will be undertaken to record which species have existing options available, and identify options for remaining species.</p> <p>Options considered feasible for flora species includes:</p> <ul style="list-style-type: none"> Seeds from x populations stored in appropriate seed banks Plant specimens in nurseries? Botanic gardens? # of plants Secure populations in national parks? Secure population in other states that can provide sources for demographic or genetic rescue <p>Options considered feasible for fauna (incl. invertebrate) species</p> <ul style="list-style-type: none"> Captive breeding population Secure population (within Victoria or in other states) that can provide sources for demographic or genetic rescue

KPI: Extent of habitats

Approach	
<p>Indicator</p> <p>Habitat extent (terrestrial, waterway, marine)</p> <p>Target</p> <p>A net gain in the overall extent and condition of habitats across terrestrial, waterway and marine environments</p> <p>Baseline</p>	<p><u>Specific transactions</u></p> <p>Standard output data will provide records of specific increased in extent due to revegetation or restoration works, as well as decreases in extent due to permitted clearing.</p> <p><u>Broad Changes - extent</u></p> <p>The acquisition of landsat imagery, together with existing and a small amount of new training data annually, will provide a basis for modelling the extent of native vegetation from a range of reflectance, structural and elevation variables derived from satellite data sets.</p> <p>Data can be disaggregated by Traditional Owner Country boundaries, catchment etc.</p>

KPI: Condition of habitats

	Approach
Indicator Habitat condition (terrestrial, waterway and marine)	Specific transactions Standard output data will provide records of specific increased in extent due to management and increased protection. Gain scoring approaches will be applied to determine the predicted gains.
Target A net gain in the overall extent and condition of habitats across terrestrial, waterway and marine environments	Broad Changes - condition Models of habitat condition will be developed to better understand the background change in condition. Site assessments of habitat condition will be undertaken in areas where change is more likely in order to supplement existing monitoring sites (e.g. Forest condition monitoring sites) and support the modelling processes.
Baseline	Data can be disaggregated by Traditional Owner Country boundaries, catchment etc.

KPI: Herbivore control

	Approach
Indicator Herbivore control in priority locations	This KPI records the effective treatment area over which introduced herbivores (both pest and domesticated (e.g. deer, rabbits, goats, horses, stock, pigs)) were controlled by killing, removing or restricting them (including harbour removal), shooting, trapping, excluding them from areas both permanently or to allow a grazing regime which promotes conservation, etc.).
Target 4 million hectares of herbivore control in priority locations	It recognises the area where the target species is located, and treated. It does not include the search area or areas where the species is present but the control approach is not used or where there is a commitment for control of a species which is not present e.g. stock exclusion where there is no stock present.
Baseline	<p>The KPI draws on data from four standard outputs:</p> <ul style="list-style-type: none">▪ 'pest animal control' effective treatment area targeting feral herbivores including goats, rabbits, feral horses, pigs.▪ 'over abundant wildlife control' (Note – for exotic wildlife only e.g. deer).▪ 'grazing' targeting changes in grazing regimes of livestock to enhance biodiversity (e.g. stock exclusion, or grazing in accordance with a biodiversity standard in a controlled manner based on specified times, density and duration).▪ 'fence' targeting area fenced for excluding animals. <p>The output data (spatial, attributes and standard applied) collected in the first year of the activity will be compared to the Strategic Management Prospects cost-effective actions and ranking of prospects outputs to determine the contribution of the action to the progress against the KPI. The action will be counted in the first year of works only. The KPI is threat specific so the area across which actions were undertaken for each individual species targeted contributes to the KPI, even where the location of the action or the</p>

action itself overlaps.

A discount rate will be applied to actions in lower ranked areas, and/or where a lower level of standard has been applied to the work.

Data can be disaggregated by Traditional Owner Country boundaries, catchment etc.

KPI: Predator control

Approach

Indicator

Predator control

Target

1.5 million hectares of predator control in priority locations

Baseline

This KPI records the effective treatment area over which introduced predators were controlled by killing, removing or restricting them (including exclusion fencing, harbour removal etc.). It recognises the area where the target species is located, and treated. It does not include the search area or areas where the species is present but the control approach is not used or where there is a commitment for control of a species which is not present e.g. rabbit control where no rabbits are present.

The KPI draws on data from the following standard output:

- 'pest animal control' effective treatment area targeting feral predators including foxes and cats.

The output data (spatial, attributes and standard applied) collected in the first year of the activity will be compared to the Strategic Management Prospects cost-effective actions and ranking of prospects outputs to determine the contribution of the action to the progress against the KPI. The action will be counted in the first year of works only. The KPI is threat specific so the area across which actions were undertaken for each individual species targeted contributes to the KPI, even where the location of the action or the action itself overlaps.

A discount rate will be applied to actions in lower ranked areas, and/or where a lower level of standard has been applied to the work.

Data can be disaggregated by Traditional Owner Country boundaries, catchment etc.

KPI: Weed control

Approach

Indicator

Weed control

Target

1.5 million hectares of weed control in priority locations

Baseline

This KPI records the effective treatment area over which all transformer weeds were controlled by killing, removing or restricting them. It recognises the area where the transformer weeds are located, and treated. It does not include the search area or areas where the species is present but the control approach is not used or where there is a commitment for control of a species which is not present. To make the maximum contribution to the KPI, all transformer weeds present in an area must be controlled.

The KPI draws on data from the following standard output:

- 'weed control' effective treatment area targeting woody and non-woody weeds.

The output data (spatial, attributes and standard applied) collected in the first year of the activity will be compared to the Strategic Management Prospects cost-effective actions and ranking of prospects outputs to determine the contribution of the action to the

progress against the KPI. The action will be counted in the first year of works only. The KPI is for the control of all transformer weeds so the area where actions were undertaken for multiple spatially overlapping individual weed species contributes only once to the KPI, rather than for each individual species.

A discount rate will be applied to actions in lower ranked areas, and/or a lower level of standard has been applied to the work such as where only some of the transformer weeds present are controlled.

Data can be disaggregated by Traditional Owner Country boundaries, catchment etc.

KPI: Restoration

Approach

Indicator

Restoration

Target

200,000 hectares of revegetation in priority areas for connectivity

Baseline

This KPI records the area where revegetation has been conducted, using relevant standards to recreate an Ecological Vegetation Class(EVC). It does not include natural regeneration or supplementary planting into existing vegetation.

The KPI draws on data from the following standard output:

- 'vegetation' area.
- Terrestrial feature

The output data (spatial, attributes and standard applied) collected in the first year of the activity will be compared to the Strategic Management Prospects cost-effective actions and ranking of prospects outputs to determine the contribution of the action to the progress against the KPI. The action will be counted in the first year of works only (i.e. establishment or preparation phase).

A discount rate will be applied to actions in lower priority areas, and/or a lower level of standard has been applied to the work such as only revegetating some lifeforms (e.g. only overstorey species), or non-indigenous or mixed revegetation to deliver other outcomes such as salinity.

Data can be disaggregated by Traditional Owner Country boundaries, catchment, and type of restoration etc.

KPI: Protected area

Approach

Indicator

Protected area

Target

200,000 hectares of new protected area on private land

Baseline

This KPI measures the area of native habitat on private land that has been protected since the commencement of the Biodiversity Plan through an agreement-in-perpetuity placed on the property title of the land or land that has been designated as an Indigenous Protected Area. The agreement must place restrictions on actions which are detrimental to biodiversity, and/ or require actions which promote biodiversity.

Areas of native habitat that have been protected for native vegetation, species or carbon offsets by an agreement with similar requirements to those outlined above will contribute to this target. Land held as freehold by a private conservation organisation or Council will not be considered as contributing to this KPI unless there is an agreement as outlined above.

Actions within these areas, together with areas in existing

agreements-in-perpetuity may also contribute to other KPI such as hectares of weed control or hectares of revegetation.

The KPI draws on data from the following standard output:

- 'management agreement' output targeting binding perpetual agreements.

The output data (spatial, attributes and standard applied) will be compared to the Strategic Management Prospects cost-effective actions and ranking of prospects outputs to determine the contribution of the action to the progress against the KPI. The action will be counted once, when it is placed on title.

A discount rate will be applied to actions in lower ranked areas, and/or a lower level of standard has been applied to the agreement.

Data can be disaggregated by Traditional Owner Country boundaries, catchment etc.
