

National Environment and Community Biosecurity Research, Development and Extension Strategy

2021-26

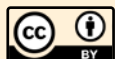
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The authors acknowledge the Traditional Custodians of the land, sea and waters across Australia. We acknowledge their continuing connection to their culture, and we pay our respects to their Elders past, present and emerging.



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THE STRATEGY AT A GLANCE

Vision

Targeted research, development and extension (RD&E) delivers greater protection of the natural environment and social amenity from biosecurity threats

Purpose

- Coordinate actions that support and promote collaboration across government, research institutions, industry and the community
- Identify and promote biosecurity RD&E priorities for investment
- Assist in the application of RD&E solutions to address biosecurity threats to natural environment and social amenity

Focus areas

Risk analysis and decision making

Detection, diagnosis and surveillance

Management methods and strategies

Stakeholder engagement

Governance, institutions and architecture

Goals

Goal 1

Establish a connected and capable biosecurity RD&E system that incorporates environment and community priorities

Goal 2

Facilitate efficient and effective national environment and community RD&E

Goal 3

Apply RD&E knowledge and solutions to environment and community biosecurity problems

Principles

Leadership guides investment and collaboration

Biosecurity and biodiversity are linked

Expert skills are critical for a functioning biosecurity system

Innovation and good science underpin the biosecurity system

RD&E is end-user and solution-focused

RD&E is applied to on-ground situations

Priorities of other biosecurity/biodiversity strategies and plans inform NECBRDES



About this Strategy

The revised National Environment and Community Biosecurity Research, Development and Extension Strategy (NECBRDES) 2021-26 aims to establish a national, coordinated and strategic approach to biosecurity research, development and extension (RD&E) for Australia's environment and community.

The three other strategies addressing Australia's biosecurity RD&E needs (see page 8) each acknowledge the requirement for better cross-strategy linkages to reduce duplication and eliminate silos, yet they have lacked a mechanism to achieve this. As a result they are managed in relative isolation from one another and miss the opportunity and mechanisms to capitalise on the efficiencies of collectively addressing cross-industry priorities. Coordinated 'cross-sectoral' and 'cross-strategy' action is required to strengthen linkages and to increase collaboration, innovation, adaptation and adoption of RD&E priorities.

Developed by the Centre for Invasive Species Solutions on behalf the Environment and Invasives Committee (EIC), the Strategy provides a framework and actions that aim to:

- better link biodiversity and biosecurity research and policy
- work collaboratively across other national RD&E strategies to identify shared priorities and opportunities and reduce duplication
- establish the foundational requirements that are critical for effective and efficient RD&E by identifying priorities and building and maintaining capability
- promote RD&E priorities for investment, maximising collaboration and innovation opportunities.

The Strategy was developed through a consultation process, where stakeholders from diverse backgrounds were involved in its co-design (see page 7). Oversight and inputs were also provided by a national steering committee, a technical expert panel and the Chief Environmental Biosecurity Officer. The Strategy was endorsed by the EIC in September 2021.

Background

The NECBRDES 2021-26 release coincides with increased recognition of environmental and community biosecurity in Australia in recent years which has resulted in the:

- formation of the EIC, responsible for providing national policy leadership on the identification, prevention and management of invasive plants, vertebrate and invertebrate species that adversely impact the environment, economy and community
- establishment of the Chief Environmental Biosecurity Officer position, whose role is to raise awareness and build Australia's capacity to manage biosecurity risks to Australia's unique environment and community
- development of the National Priority List of Exotic Environmental Pests, Weeds and Diseases
- release of the National Biosecurity Statement, which assigns equal weight to the importance of protecting the environment and economy from biosecurity threats
- development of the Environmental Biosecurity Framework for transforming and strengthening Australia's environmental biosecurity system.

These new foundations for Australia's environmental and community biosecurity resulted from the 2017 report 'Priorities for Australia's biosecurity system' (Craik et al. 2017) which concluded that Australia's environmental pest and disease risks were yet to be systematically identified, prioritised and planned for. They explicitly address environmental risk and afford the same priority to environmental and community biosecurity as human health and primary production.

Originally developed in 2014 when national approaches and investment in RD&E were highly fragmented, the NECBRDES 2016-19 implementation stalled in the absence of formal structures, support, coordination and investment. These newly developed environmental biosecurity capabilities will provide the mechanisms to support and implement the revised 2021-26 Strategy.

Scope

This Strategy encompasses all aquatic (marine and freshwater) and terrestrial pests* that negatively affect the environment, social amenities, infrastructures, transport, utilities and/or human lifestyles and wellbeing.

A more detailed list of the scope with examples is provided in *Appendix 1*, page 18.

* Pest definition is based on the Intergovernmental Agreement on Biosecurity interpretation (see *Glossary*, page 17).

Existing context and challenges

Despite the welcome advances made in recent years – see *Background*, page 3 – addressing biosecurity threats to Australia's environment and community is challenging and underscored by the following complexities:

- The scope of environment and community biosecurity is very broad encompassing nine sectors (see table below), each with its own researchers, technical and organisational capacity and RD&E priorities.
- Further work is needed to build functioning cross-sector networks for better communication and collaboration.
- Some sectors or stakeholders may be less able to engage and collaborate due to capacity, knowledge or skills gaps.
- The knowledge that we do have about native species and ecosystems often resides within different organisations to biosecurity expertise (i.e. with biodiversity researchers), resulting in disparate RD&E approaches.
- The large number of potential threats, native species and ecosystems potentially at risk means there may be significant knowledge gaps.
- Environment and community biosecurity lacks the commercial incentives that drive research and on-ground action for primary industries' biosecurity, instead relying on government, philanthropic and community investment.
- Communities need improved tools and systems to foster effective engagement in general biosecurity surveillance.
- There has been limited interaction with other national biosecurity RD&E strategies (plant, animal and marine) despite often sharing biosecurity issues.
- Environment and community biosecurity RD&E actions are housed across multiple locations (e.g. in Threat Abatement Plans (TAPs) etc.).
- The increasing risk and complexity of future biosecurity threats amplify the competitive nature of limited RD&E funding.

For additional challenges and opportunities driving environment and community biosecurity see *Key drivers*, page 5.

Sectors relevant to this Strategy

Sector	Examples
Diseases of terrestrial wild animals	Includes pathogens, parasites, potential animal vectors of diseases and invertebrate pests of animals
Diseases of marine and freshwater wild animals	Includes pathogens, parasites, potential animal vectors of diseases and invertebrate pests of animals
Diseases of captive animals	Zoo, aquarium, companion animals, except horses Includes pathogens, parasites, potential animal vectors of diseases and invertebrate pests of animals
Human disease animal vectors	Includes mosquitoes and ticks that may vector human diseases or zoonotic diseases of human importance
Vertebrate pests	Alien and native mammals, birds, reptiles, amphibians, fish
Invertebrate pests with impacts on social amenity or natural values and freshwater	e.g. ants, wasps, spiders, leeches
Environmental weeds	Terrestrial and freshwater
Marine pests	Invertebrate, vertebrate and plant pests
Pests and diseases of plants in natural ecosystems and/or social amenities	Includes pests and diseases of native and non-native amenity plants

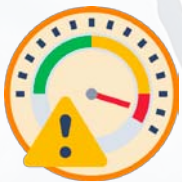
Note: Sectors correspond to the traditional groupings of pests, weeds and diseases that have been used in Australia.

Key drivers



Biodiversity decline

With over 80% of nationally threatened terrestrial and freshwater plants and animals impacted by invasive species (Kearney et al. 2019), biodiversity will continue to decline without knowledge, technologies and strategies to prevent new pests and diseases and to reduce impacts of existing ones.



Increasing risks

An increase in trade and tourism; pathways to natural areas; and frequency and severity of disturbance events (i.e. climate change) are putting additional pressure on the natural environment and social amenity.



Future workforce: the need for continued expertise

To support a robust biosecurity system, there must be national support for the next generation of biosecurity experts including improved skill-sharing between biosecurity and biodiversity disciplines.



Improving RD&E delivery

With growing biosecurity threats and increasing pressure on resourcing, it is critical to deliver efficiencies across biosecurity RD&E through effective leadership, national and international collaboration, and better coordination.



Advances in technology

Increasing acceptance and availability of new technologies provides novel opportunities to address biosecurity problems.



Land managers need on-ground solutions

End users of biosecurity RD&E want involvement in shaping the biosecurity RD&E agenda to ensure it is producing on-ground solutions.

Purpose

The purpose of NECBRDES 2021-26 is to:

- coordinate actions that support and promote collaboration across government, research institutions, industry and the community
- identify and promote biosecurity RD&E priorities for investment
- assist in the application of RD&E solutions to address biosecurity threats to natural environment and social amenity.

Goals

To achieve the purpose, three strategic goals have been defined:

- **Goal 1** Establish a connected and capable biosecurity RD&E system that incorporates environment and community priorities
- **Goal 2** Facilitate efficient and effective national environment and community RD&E
- **Goal 3** Apply RD&E knowledge and solutions to environment and community biosecurity problems

'Cross-sector' refers to working on shared priorities and actions across the many sectors covered by this Strategy (page 4).

'Cross-industry' and **'cross-strategy'** refer to working across RD&E strategies that deal with biosecurity matters outside the scope of this Strategy (e.g. biosecurity impacting production and marine environments).

Strategy approach

Within a landscape of increasing risk and funding competition, the NECBRDES revision presents an opportunity to concentrate on where the most value can be added. **This is in the cross-sector and cross-strategy space through coordinated action to strengthen linkages and increase collaboration, innovation, adaptation and adoption of RD&E priorities.**

Working across the broad scope, diverse sectors and numerous linked plans and strategies will require dedicated coordination. Figure 1 shows how coordination can achieve the Strategy's three goals and their related objectives and progress the vision of the Strategy. This model has been successfully used to implement the Plant Biosecurity Research Initiative Strategy 2018-2023. The NECBRDES Strategy focuses on providing coordination to drive innovation and promote a culture of collective problem solving and a shared purpose and vision.



Figure 1 How national coordination will achieve the outcomes that lead to the NECBRDES vision

Stakeholders

Stakeholders	Relevance to the Strategy
Research providers	The Strategy draws on the expertise of research providers, both in Australia and internationally, to identify what we know and what we need to know. The Strategy also supports research providers by addressing capability needs such as skills retention.
Research funders	The Strategy facilitates the identification and review of environmental and community biosecurity priorities, providing direction for funding bodies on where investments will have the greatest national benefit.
Knowledge brokers	Knowledge brokers, e.g. natural resources management organisations, Landcare networks and community leaders, act as intermediaries between knowledge producers and users. This extension role means they will be critical to the Strategy implementation.
Research users and beneficiaries	It is critical that perspectives and needs of users and beneficiaries, including Indigenous land managers, are considered in the development of RD&E priorities. The Strategy outcomes will inform best-practice efforts required by government, industry and the public to ensure biosecurity threats to the environment and community are reduced.
Deliverers of other national biosecurity RD&E strategies	The Strategy implementation will drive better coordination between the implementation of all national RD&E strategies. It will seek to find efficiencies by identifying practical solutions for shared problems across the biosecurity system.



Great Barrier Reef (Victor Huertas, Queensland Government)

Indigenous engagement

Aboriginal and Torres Strait Islander people have continuously and actively managed their lands and waters for over 65,000 years (Clarkson et al. 2017 as cited in Jarret et al. 2020). As Australia's largest land custodians, Indigenous communities are critical partners in NECBRDES 2021-26. This Strategy recognises the importance of improving engagement practices to ensure Indigenous and western science, knowledge and values inform biosecurity RD&E from national priority setting through to on-ground application.

Australia's Biosecurity Future: Unlocking the next decade of resilience (CSIRO 2020), identified three recommendations for improving Indigenous engagement in biosecurity:

1. Make biosecurity engagement with Indigenous communities a more systemic process of the system.
2. Empower Indigenous involvement in biosecurity through co-development of fit-for-purpose technology solutions and creation of economic opportunities.
3. Increase Indigenous representation at senior decision-making levels.

These recommendations will guide engagement with the Indigenous community in the implementation of the Strategy and in recognising Indigenous perspectives and RD&E interests.

Strategic alignment – national

The following table identifies the overarching national biosecurity RD&E strategies and their attributes that are complementary to NECBRDES 2021-26. These will be targeted through actions in this Strategy to achieve joint implementation where beneficial to do so, and enhance integration of national biosecurity RD&E.

See *Appendix II* for a list of additional key national strategies, documents and programs.

Strategy	Description	Strategy alignments
Plant Biosecurity Research Initiative (PBRI) Strategy 2018-2023	Seeks to collaborate, prioritise and co-invest in RD&E that minimises the impact of damaging endemic and exotic pests, diseases and weeds that affect Australia's plant industries, regional communities, and the environment.	Scope overlap where native plants act as an alternative host for pests and diseases, or in the commercial production of native plants (forestry or nurseries and gardens). Alignments include: <ol style="list-style-type: none"> 1. identifying targeted cross-sectoral plant biosecurity innovation for co-investment 2. responsive coordination and leveraging of high value cross-sectoral investment in plant biosecurity innovation 3. promotion and facilitation of collaboration for better plant biosecurity outcomes for industry, their communities, and the environment.
National Animal Biosecurity RD&E Strategy 2017-2022 (NABRDES)	A cross-industry strategy to promote greater collaboration and continuous improvement in the investment spent on primary industries' RD&E resources nationally.	Potential scope overlap between pests and diseases of wildlife, companion animals and pest animals that impact livestock. General alignment of the tactical priorities (communication, surveillance, collaboration, education/training, policy/legislation).
National Priorities for Introduced Marine Pest Research and Development 2013-2023	Provides direction for introduced marine pest research and development activities.	Scope aligns: non-native marine plants and animals that harm, or potentially harm, Australia's marine environment and social amenity. Priority areas align: vector management; species and ecological information for management; monitoring, evaluation and review; and information, communication and education. Collaborating opportunities include promoting priority areas and progressing RD&E that is mutually beneficial to the implementation of both strategies.



Focus areas

This Strategy recognises five focus areas of priority RD&E. Each area includes applied research on pests and diseases, relevant research on native species and natural systems, as well as social science to improve science communication, science literacy and affect behaviour change. Priority areas span all stages of invasion from prevention to asset protection, pre-border and post-border.

Focus areas are high level and encompass the broad categories that are nationally agreed as critical components of a functioning and responsive biosecurity system. They also map to the national biosecurity RD&E priorities and national strategies including Key Threatening Process strategies and Threat Abatement plans under the *Environment Protection and Biodiversity Conservation Act 1999*.

The individual priorities that sit within the focus areas were developed through stakeholder consultation during the development of the NECBRDES 2016-19 and were reviewed and refined during consultation on this revised version. The individual priorities, while

not included in this Strategy, will form part of the implementation plan and will be useful at the project planning stage.

Focus areas help to inform:

- where to focus investment
- cross-sector priorities – those shared by the nine sectors covered in the scope of this Strategy
- priorities that are unique to a single sector or to environment and community biosecurity
- cross-strategy priorities – actions where progression will also benefit production and other areas of biosecurity.

Figure 2 shows how the focus areas underpin this Strategy and where further refinement occurs through the review process for Goal 1. Refined RD&E priorities then direct investment decisions and collaborations (Goal 2), which informs where support is needed to ensure RD&E outcomes are applied 'on-ground' (Goal 3).

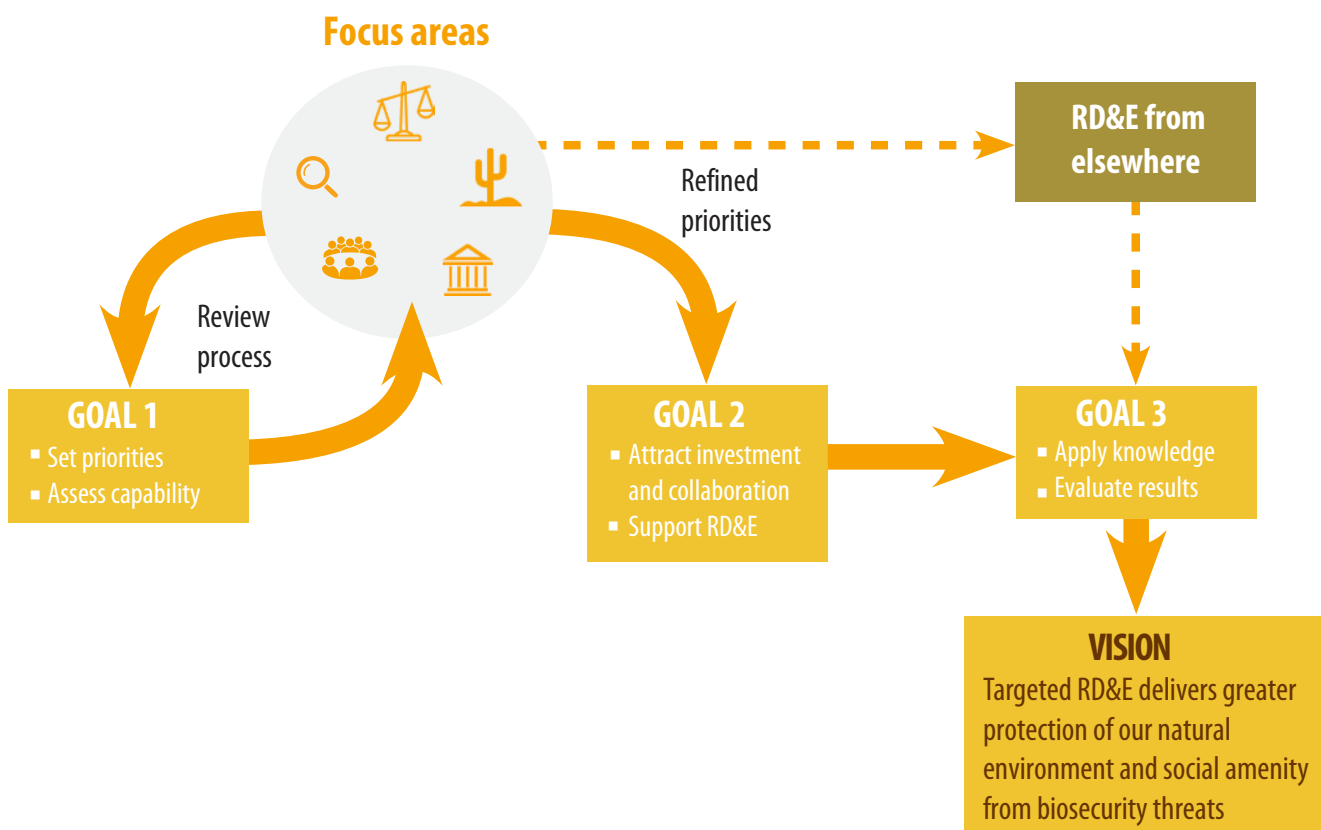


Figure 2 Relationship between focus areas and Strategy goals

Focus area priority examples

Focus area

Examples of priorities

Risk analysis and decision making



- Develop/refine risk assessment processes
- Characterise and prioritise spread pathways
- Quantify effects of multiple threats (e.g. weed A + weed B + pest animal + fire)
- Develop approaches to quantify costs
- Refine decision making frameworks
- Better understand the complexities associated with managing natural systems, including what influences their resilience to biosecurity threats

Detection, diagnosis and surveillance



- Refine or develop detection and surveillance techniques and diagnostic procedures
- Develop methods to assess the effectiveness of detection and surveillance systems currently in use
- Develop and refine tools to enable community engagement in surveillance and management

Management methods and strategies



- Review, improve and develop new management tools including the needs identified in biodiversity strategies and plans
- Identify key biological vulnerabilities of pests and diseases
- Review and improve effectiveness of existing policy instruments, management guidelines and techniques

Stakeholder engagement



- Work with communities, stakeholders and partners to understand the diversity of perceptions and drivers for behavioural change and action
- Understand effective engagement styles for specific audiences e.g. Indigenous community

Governance, institutions and architecture



- Analyse and assess current governance and institutional arrangements across plant, animal and environmental biosecurity
- Understand the effectiveness of existing regulatory tools such as Biosecurity Duties and Biosecurity Orders

Goal 1 Establish a connected and capable biosecurity RD&E system that incorporates environment and community priorities

There are two foundational needs to ensure that RD&E outcomes contribute to minimising the threat and impact posed by pests and diseases to the environment and community: 1) priorities must be set and agreed and 2) system capability must be improved.

Priority setting

Across the Strategy's nine sectors, national coordination is needed to connect stakeholders to each other and to end users, and to identify shared priorities as well as unique sector needs. National coordination will also connect stakeholders

responsible for the delivery of the national plant, animal and marine RD&E strategies, and work with them to identify shared cross-industry priorities and opportunities for collaboration.

Coordination of Objectives 1.1 and 1.2 will guide investment, leverage funding and increase efficiencies by working collaboratively to progress biosecurity and community biosecurity RD&E.

Understanding and increasing capability

As identified in the inaugural NECBRDES 2016-19, there are several vulnerabilities in biosecurity RD&E. These included limited capabilities in taxonomy and socio-economic sciences, an ageing pool of expertise, a lack of succession planning and the cost of maintaining infrastructure. The first NECBRDES recommended a comprehensive national biosecurity capability analysis which is addressed through Objective 1.3.

Objective	Strategic actions
1.1 Coordinate national RD&E priority setting for all sectors included in NECBRDES 2021-26	<p>1.1.1 Establish a NECBRDES cross-sector working group to:</p> <ul style="list-style-type: none"> refine existing RD&E priorities across the five focus areas identify NECBRDES cross-sector priorities and distinct sector priorities develop an analytic framework that matches cross-sector problem statements with possible solutions including platform technologies <p>1.1.2 Integrate biosecurity RD&E priorities with biodiversity threat reduction priorities to maximise benefits for threatened species and reflect this alignment in TAPs and Key Threatening Processes strategies</p> <p>1.1.3 Complete the gap analysis stocktake of national, jurisdictional and regional plans/strategies to identify linkages and align priorities</p>
1.2 Link RD&E priorities across the biosecurity system	<p>1.2.1 Establish, and coordinate actions arising from, a cross-strategy working group to:</p> <ul style="list-style-type: none"> work to common goals and identify shared priorities across the four national biosecurity RD&E strategies develop a cross-strategy implementation plan to maximise efficiencies, reduce duplication and identify how RD&E knowledge can be applied across biosecurity <p>1.2.2 Collaboratively develop a cross-strategy framework and supporting extension materials to guide biosecurity RD&E investment decisions</p> <p>1.2.3 Support the Chief Environmental Biosecurity Officer in progressing recommendations to the Environment and Invasives Committee and National Biosecurity Committee on improving the operating structure of the four national biosecurity RD&E strategies</p>
1.3 Identify gaps and address vulnerabilities in RD&E capability	<p>1.3.1 Undertake a comprehensive analysis of national biosecurity RD&E capabilities and develop recommendations for improvement</p> <p>1.3.2 Facilitate the implementation of recommendations arising from 1.3.1</p> <p>1.3.3 Develop and maintain a capability database consisting of information on individuals and organisations with expertise and facilities</p>

Goal 2 Facilitate efficient and effective national environment and community RD&E

Goal 1 will result in agreed biosecurity RD&E priorities and increased RD&E capability, which can be progressed in Goal 2 through coordination and facilitation to maximise RD&E opportunities.

This will be achieved through:

- maximising investment opportunities and facilitating priority research
- maximising collaboration and innovation opportunities including data collation and data sharing
- providing support to RD&E projects and initiatives.

Objective	Strategic actions
2.1 Facilitate investment in biosecurity RD&E priorities	<p>2.1.1 Build the overall case for greatly increasing investment in biosecurity RD&E, including the potential environmental, social and economic benefits. Examples include:</p> <ul style="list-style-type: none">▪ assisting in the development of business cases for potential investors or partners (e.g. industry groups)▪ demonstrating the value of environment and community biosecurity RD&E and engendering broader community support <p>2.1.2 Ensure alignment between environment and community RD&E priorities (identified in 1.1) and conventional funding streams (e.g. National Environmental Science Program, state and territory agencies)</p> <p>2.1.3 Investigate non-conventional investment opportunities, using tools developed in 2.1.1 to leverage investment from other funding sources (e.g. industry, philanthropic etc.)</p>
2.2 Facilitate information sharing, partnerships and collaborations	<p>2.2.1 Develop, maintain and promote the use of an inventory or portal of current/historic RD&E activities and outcomes and data relevant to environmental and community biosecurity</p> <p>2.2.2 Organise at least one annual forum to link the Strategy sectors, evaluate progress, reaffirm priorities and on-ground needs and discuss opportunities and emerging issues</p> <p>2.2.3 Support and encourage community participation in research (e.g. Citizen Science etc.)</p>
2.3 Support new and existing biosecurity RD&E to maximise environment and community outcomes	<p>2.3.1 Utilise user group networks (e.g. network of national coordinators) to develop list of potential RD&E projects, map these to priority areas and present ideas to researchers for progression when funding opportunities arise</p> <p>2.3.2 Assist researchers in the development of project proposals, ensuring projects align to priorities, end user needs and that partnerships and collaborations are maximised</p> <p>2.3.3 Link researchers, government and end users as RD&E progresses, to address policy or social license needs, or identify additional research or extension that may be needed to maximise uptake</p>

Goal 3 Apply RD&E knowledge and solutions to environment and community biosecurity problems

Goal 3 focuses on practical uptake of the knowledge that arises from Goal 2 to achieve social license, practice change and impact reduction on-ground.

This goal recognises science communication activities are key to ensuring that RD&E findings from any discipline (directly or indirectly related to biosecurity) are translated and applied. Strategic actions listed here utilise national coordination to provide a conduit between disparate research and policy areas and land managers, to seek out relevant knowledge and facilitate its application to environmental and community biosecurity.

Objective	Strategic actions
3.1 Translate environment and community RD&E knowledge for applied use (e.g. on-ground management)*	<p>3.1.1 Conduct an annual review of literature and learnings across biosecurity and cross-over disciplines (e.g. biodiversity, human health) to identify research findings relevant to environment and community biosecurity and translate these into summary documents suitable for applied use</p> <p>3.1.2 Facilitate the availability and accessibility of RD&E knowledge and solutions (e.g. through the use of surveillance apps, herbicide registrations etc.)</p> <p>3.1.3 Extend knowledge by developing, adopting or adapting engagement approaches that are appropriate for intended end users (e.g. storyboards for First Nations people)</p>
3.2 Facilitate distribution, discussion and discovery of national environment and community knowledge and outcomes	<p>3.2.1 Promote use of a common repository for biosecurity knowledge sharing (including outputs from 1.3.3, 2.2.1, 2.3.1 and 3.1.1)</p> <p>3.2.2 Use the forum identified in 2.2.2 to extend research to encourage adoption, adaptation and innovation</p> <p>3.2.3 Support outreach programs (e.g. for school children, land managers) aimed at encouraging and facilitating a culture and desire to improve environments and communities through biosecurity-related action</p>
3.3 Encourage and support monitoring and evaluation of RD&E knowledge and application	<p>3.3.1 Promote the inclusion of robust monitoring programs when research is applied to on-ground management</p> <p>3.3.2 Develop case studies that demonstrate monitoring and evaluation in action and its contribution to adaptive management and improvement</p> <p>3.3.3 Encourage use of the forum identified in 2.2.2 to communicate the results of monitoring and adaptive management</p>

* The translation of environment and community RD&E knowledge for applied use may require further social research to ensure that communication messages are suitable for the target audience. This need has been identified in the focus areas (page 9).

Outcomes

Aligned to each Goal, several outcomes that represent the desired end state will be achieved through the Strategy delivery.

Goal 1 Objectives

Outcome

- | | |
|--|---|
| 1.1 Coordinate national RD&E priority setting for all sectors included in NECBRDES | <ul style="list-style-type: none"> ▪ Key RD&E priorities within the five focus areas collectively identified and agreed by stakeholders |
| 1.2 Link RD&E priorities across the biosecurity system | <ul style="list-style-type: none"> ▪ A better connected biosecurity RD&E system ▪ Increased RD&E capacity, efficiency and willingness to address biosecurity issues of the environment and community sector |
| 1.3 Identify gaps and address vulnerabilities in RD&E capability | <ul style="list-style-type: none"> ▪ Increased RD&E capacity ▪ Retention and transfer of specialist skills and knowledge ▪ Increased RD&E preparedness to respond to biosecurity incidents |

Goal 2 Objectives

Outcome

- | | |
|--|---|
| 2.1 Facilitate investment in biosecurity RD&E priorities | <ul style="list-style-type: none"> ▪ The importance of biosecurity RD&E is understood by the public and private sector, resulting in greater investment in agreed RD&E priorities ▪ Greater alignment of funds to identified and agreed RD&E priorities |
| 2.2 Facilitate information sharing, partnerships and collaborations | <ul style="list-style-type: none"> ▪ Knowledge sharing between researchers – and also between researchers and end users (on-ground practitioners, community etc.) – is enhanced, leading to efficiencies, adaptation and innovation ▪ More cost-effective allocation of limited resources |
| 2.3 Support new and existing biosecurity RD&E to maximise environment and community outcomes | <ul style="list-style-type: none"> ▪ The link between researchers, government and end users is strengthened ▪ RD&E priorities of environment and community are addressed through RD&E activities ▪ Better utilisation of available RD&E funds, capabilities and infrastructure, and reduced transaction costs across Australia |

Goal 3 Objectives

Outcome

- | | |
|--|--|
| 3.1 Translate environment and community RD&E knowledge for applied use (e.g. on-ground management) | <ul style="list-style-type: none"> ▪ Effective science communication of RD&E knowledge and solutions ▪ Increased uptake and use of knowledge aimed at reducing the impact of biosecurity threats on the environment and community |
| 3.2 Facilitate distribution, discussion and discovery of national environment and community knowledge and outcomes | <ul style="list-style-type: none"> ▪ Biosecurity knowledge is accessible and integrated with biodiversity knowledge ▪ Interest and involvement in biosecurity and biodiversity related action is enhanced ▪ Science literacy amongst land managers and the community is increased |
| 3.3 Encourage and support monitoring and evaluation of RD&E knowledge and application | <ul style="list-style-type: none"> ▪ Ability to prevent and respond to biosecurity threats impacting the environment and community is continually improving through adaptive management ▪ A greater understanding of the factors that contribute to successful on-ground application of RD&E |

Measures of success

A monitoring and evaluation framework will be developed as part of the NECBRDES 2021-26 implementation plan. The framework will identify performance measures and evaluation methods; establish an evidence base; consider stakeholder participation in evaluation activities; and communication of evaluation findings.

Governance and implementation

Environment and Invasives Committee

The Environment and Invasives Committee (EIC) provides national policy leadership on environmental biosecurity, including engaging with stakeholders and working with other national committees to provide consistent and consolidated advice on environmental biosecurity issues across the national biosecurity system.

The EIC is the custodian of NECBRDES 2021-26 and will provide high level oversight of its implementation.

The EIC will:

1. identify resourcing for a national coordinator, operating budget and an independent review
2. provide strategic oversight and direction for the implementation of NECBRDES, including support to the coordinator
3. oversee the development and endorsement of the NECBRDES Implementation Plan
4. participate in biannual meetings to discuss implementation progress
5. organise an independent review of the Strategy implementation.

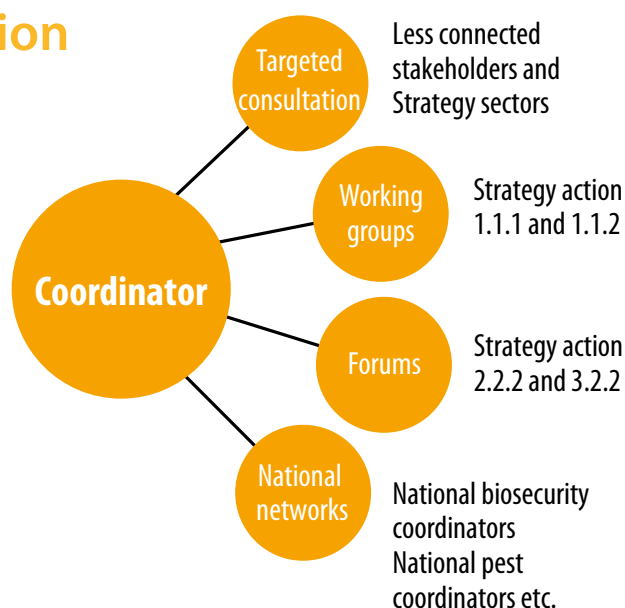
Membership of the EIC:

- Representatives of agriculture and environment agencies from the Australian Government and each state and territory jurisdiction
- The Chief Environmental Biosecurity Officer
- Observers: CSIRO, Plant Health Australia, Animal Health Australia, Centre for Invasive Species Solutions, Australian Bureau of Agricultural and Resource Economics and Sciences, Wildlife Health Australia

The Terms of Reference permits additional observers by invitation for specific agenda items. Invitations for NECBRDES related items could be extended to other key stakeholders e.g. Marine Sectoral Committee, the Threatened Species Commissioner, Department of Health and other cross-over departments, relevant research institutes and Indigenous representatives (in line with Jarret et al. 2020, Recommendations 10-12).

Strategy implementation

In recognition of the broad scope and diverse stakeholder groups involved in NECBRDES, the following arrangements will maximise opportunities for involvement in its implementation:



- Appointment of one full time coordinator to encourage stakeholder participation in the Strategy implementation – as identified in the NECBRDES Communication Plan – with a focus on Indigenous organisations, environmental NGOs, academia/universities, industry and community organisations.
- Targeted consultation with those Strategy sectors or broader stakeholders not well connected with established biosecurity networks.
- Cross-sector and cross-strategy working groups.
- Facilitation of national forums.
- Utilisation of other established national networks.

Working groups

- A cross-sectoral working group will be established to progress strategic action 1.1.1. Membership will consist of (i) the coordinator; (ii) one representative from each of the Strategy's nine sectors and (iii) representatives from the resilient landscape hub of the National Environmental Science Program. This working group should also have representation from end users to ensure research priorities are aligned to needs.
- A cross-strategy working group will be established to progress strategic action 1.2.1. Membership will consist of the coordinator (or representative) for each of the four national strategies – see page 8 and page 11.
- Other working groups may be formed at the discretion of EIC or the coordinator to advance specific strategic actions.

The working groups will meet on an as-needs basis with a minimum of two meetings each year.

National coordination

Overseen by the Environment and Invasives Committee, Strategy implementation will be driven by a dedicated coordinator who will focus on delivering its actions (0.75 FTE) and assist in the cross-strategy space (0.25 FTE), working across the four RD&E strategies to drive better cross-strategy collaboration and activities. Their workplan will be informed by the actions under each Goal, with their role to deliver high level strategic communication and to drive Strategy outcomes.

They will:

- provide a vehicle for consultation, coordination and communication between environmental and community biosecurity stakeholders and other relevant strategies
- communicate, promote and coordinate Strategy implementation
- lead the development of a five-year implementation/workplan including a monitoring and evaluation plan and refined RD&E priority list.

Cross-strategy coordination and collaboration

A stronger focus on identifying and progressing RD&E priorities of shared interest across biosecurity is needed. As a cross-sectoral strategy, NECBRDES is well placed to lead this process, and has identified actions under Objective 1.2 to facilitate better linkages across national RD&E strategies. Actions in Objective 1.2 aim to improve cross-strategy and cross-industry communication and connections in the short term.

Figure 3 presents a timeline of the revision schedule of each the four strategies, and the opportunities to integrate and align the four strategies using actions under Objective 1.2.

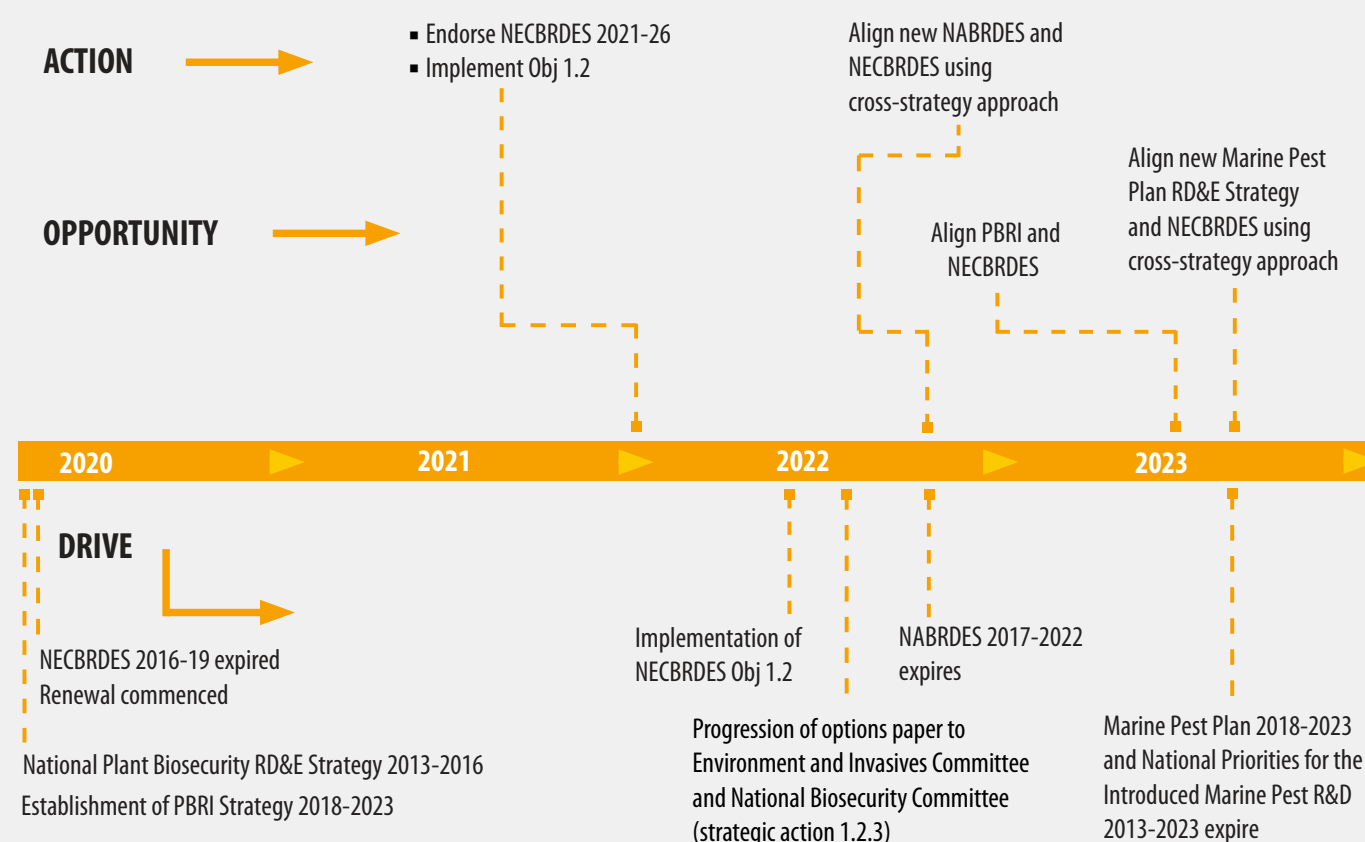


Figure 3 Timeline of national biosecurity RD&E strategy revisions and opportunities to integrate and align strategies using actions under Objective 1.2 of NECBRDES 2021-26 (see page 8 for national strategy details)

References

- Clarkson, C, Jacobs, Z, Marwick, B et al. 2017 Human occupation of northern Australia by 65,000 years ago. *Nature* 547, 306-310.
- Craik, W, Palmer, D & Sheldrake, R 2017 *Priorities for Australia's biosecurity system: an independent review of the capacity of the national biosecurity system and its underpinning Intergovernmental Agreement*, Canberra.
- Jarret, L, Williams, G, Charnock, S 2020 *Australia's Biosecurity Future: Unlocking the next decade of resilience (2020-2030)*. CSIRO, Melbourne.
- Kearney, SG, Cawardine, J, Reside, AE, et al. 2019 The threats to Australia's imperilled species and implications for a national conservation response. *Pacific Conservation Biology* 25(3), 231-244.

Glossary

Term	Definition
Biosecurity	The management of the risks to the economy, the environment, and the community of pests and diseases entering, emerging, establishing or spreading.
Disease	The presence of a pathogenic agent in a host and/or the clinical manifestation of infection that has had an impact (i.e. significant negative consequences) or poses a likely threat of an impact. It includes micro-organisms, disease agents, infectious agents and parasites.
Community	Human society and its activities, including human health and social amenity.
Environmental biosecurity	<p>The protection of the environment and/or social amenity from the risks and negative effects of pests and diseases entering, emerging, establishing or spreading in Australia.</p> <ul style="list-style-type: none">Environment includes Australia's natural terrestrial, inland water and marine ecosystems and their constituent parts, and its natural and physical resources.Social amenity – that part of social amenity (see below) provided by the environment or nature.
Pest	Any species, strain or biotype of the Kingdoms Animalia (excluding human beings), Plantae, Fungi, Monera or Protista that has had an impact (i.e. significant negative consequences), or poses a likely threat of having an impact, on human, plant or animal health, the environment or social amenity.
Social amenity	The intangible and tangible social, economic and cultural resources provided by humans or nature including tourism, human infrastructure, cultural assets and national image (e.g. dwellings and parks, views and outlooks).



Appendix I

Strategy scope

Category of organism	Examples	
Aquatic – marine and freshwater	Vertebrates	<ul style="list-style-type: none"> ▪ Pest fish (e.g. tilapia), amphibians and aquatic reptiles (e.g. red-eared slider turtle)
	Invertebrates	<ul style="list-style-type: none"> ▪ Pest animals (e.g. Pacific oysters, zebra mussel) ▪ Overabundant or displaced native animals adversely affecting aquatic ecosystems (e.g. smooth marron, crown of thorns starfish) ▪ Parasites of wild animals and aquarium animals ▪ Vectors of animal and human diseases ▪ Pests of plants
	Plants	<ul style="list-style-type: none"> ▪ Weeds (e.g. salvinia, cabomba) ▪ Invasive seaweed and microscopic algae (e.g. didymo)
	Pathogens	<ul style="list-style-type: none"> ▪ Disease agents of wild animals and aquarium animals ▪ Disease agents of plants
Terrestrial	Vertebrate	<ul style="list-style-type: none"> ▪ Feral domestic animals (e.g. camels, horses, cats, rabbits) ▪ Alien mammals (e.g. foxes, hares), birds (e.g. Indian myna), amphibians (e.g. cane toad) and reptiles (e.g. Asian house gecko) ▪ Overabundant or displaced native animals adversely affecting natural ecosystems (e.g. kangaroos) ▪ Vectors of animal diseases, including zoonotic and human diseases (e.g. bat as vector of Hendra virus)
	Invertebrates	<ul style="list-style-type: none"> ▪ Parasites of wild animals ▪ Parasites of captive animals (zoo, companion animals, except horses) ▪ Pests of social amenities (e.g. wasps, ants, red back spiders) ▪ Vectors of animal diseases, including zoonotic and human diseases (e.g. mosquito, tick) ▪ Pests of plants in natural ecosystems and social amenities (e.g. fire ants)
	Plants	<ul style="list-style-type: none"> ▪ Environmental weeds (e.g. lantana, gamba grass, opuntoid cacti) ▪ Native plants outside of natural range adversely affecting natural ecosystems (e.g. sweet pittosporum)
	Pathogens	<ul style="list-style-type: none"> ▪ Diseases of wild animals ▪ Diseases of captive animals (zoo, companion animals, except horses) ▪ Diseases of plants in natural ecosystems and/or social amenities (e.g. myrtle rust)

Appendix II

Strategic alignments – other

There are many strategies, policies and programs – national/state/regional level, government and industry produced – which acknowledge the importance of, or seek to further define and address, biosecurity RD&E priorities.

The NECBRDES 2016-19 Gap Analysis report provided information on many of these documents and their

alignment to NECBRDES and Goal 1 of this Strategy will enable a further stocktake and mapping to relevant strategies, policies and programs.

The following list, while not exhaustive, focuses on key national strategies, documents and programs that make clear reference to the environment and social amenity.

Strategy	Alignments and links
Australia's Biosecurity Future: Unlocking the next decade of resilience (2020-2030)	<ul style="list-style-type: none"> ▪ System connectivity, shared responsibility and innovation in science and technology ▪ Improved Indigenous engagement through Recommendations 10 to 12 ▪ Invest in pathways for the career development and training of biosecurity specialists and researchers (Recommendation 19)
Australian Pest Animal Strategy 2017-2027	<p>Goal 1: Provide leadership and coordination for the management of pest animals:</p> <p>1.3 To improve public awareness of pest animals, research coordination and its support for pest management at the national level, and adoption of best practice management methods</p>
Australia's Strategy for Nature 2019-2030	<ul style="list-style-type: none"> ▪ Reduce threats and risks to nature and build resilience (Objective 7) ▪ Increase knowledge about nature to make better decisions (Objective 10) ▪ Biosecurity is also mentioned in relation to Key Threatening Processes
Australian Weeds Strategy 2017-2027	<p>Goal 3: Enhance Australia's capacity and commitment to weed management Priorities:</p> <p>3.2 Maintain and enhance long-term research, development and extension capacity and capability</p> <p>3.3 Develop and apply national data, information and knowledge infrastructure to support effective weed management</p>
Cross Sectoral R&I Priorities 2018	<p>Three platform technologies were identified for further investigation:</p> <ol style="list-style-type: none"> 1. Machine learning 2. Data technologies 3. Next generation sequencing <p>NECBRDES promotes the use of these to address key priorities through Action 1.1.1</p>
DAWE – Biosecurity RD&E Strategic Statement 2018-2025	<ul style="list-style-type: none"> ▪ Establish, promote and review RD&E priorities to guide investment decisions ▪ Plan and conduct activities and projects collaboratively to maximise return on investment ▪ Ensure research projects provide scientifically sound evidence to inform policy decisions

Strategy	Alignments and links
Environmental Biosecurity Framework 2021	The framework raises the awareness of threats to the natural environment and social amenity so that they can be embedded within the broader biosecurity system. It actions the development of a National Environmental Biosecurity Strategy by 2022.
Marine Pest Plan 2018-2023	NECBRDES priority research areas align with the five objectives of the Plan: <ul style="list-style-type: none"> ▪ Minimise the risk of marine pest introductions, establishment and spread ▪ Strengthen the national marine pest surveillance system ▪ Enhance Australia's preparedness and response capability for marine pest introductions ▪ Support marine pest biosecurity research and development ▪ Engage stakeholders to better manage marine pest biosecurity
National Environmental Science Program (NESP) Phase 1 (2014-21) Phase 2 (2020-27)	NESP is a long-term commitment by the Australian Government to fund environment and climate research. Of relevance is the Resilient Landscapes Hub, which provides research to inform management of Australia's terrestrial and freshwater habitats, promoting resilience, sustainability and productive practices.
The National Priority List of Exotic Environmental Pests, Weeds and Diseases Implementation Plan	The Implementation Plan has been finalised and endorsed by the EIC. It identifies and prioritises actions to reduce the risk of entry, establishment, and spread of these exotic species in Australia. This will help identify NECBRDES investment priorities.
National Threat Abatement Plans (TAP)	There are several TAPs that have been developed for Key Threatening Processes (which include pests and disease) listed under the <i>EPBC Act 1999</i> . The research and development needs identified should inform priorities of NECBRDES. Located at: http://www.environment.gov.au/biodiversity/threatened/threat-abatement-plans
Ten-year National Roadmap for Wildlife Health RD&E	Due for release in 2022, this will be a critically important resource to inform national RD&E priorities within NECBRDES for wildlife health.
Threatened Species Strategy 2021-2031	Key action area 1: Mitigating new and established threats Key action area 6: Knowledge and tools Collaboration and knowledge sharing between biosecurity and biodiversity researchers and practitioners will ensure biosecurity threats to threatened species and communities are identified, prevented or minimised.



NATIONAL ENVIRONMENT AND COMMUNITY

BIOSECURITY RD&E STRATEGY



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