# ENVIRONMENTAL BIOSECURITY: BEST PRACTICE

## A Guide for Australian Policy-makers

**invasive**
species council

# Environmental biosecurity: Best practice

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**The Invasive Species Council welcomes constructive feedback on this guide**

### About the Invasive Species Council

The Invasive Species Council was formed in 2002 to advocate for stronger laws, policies and programs to keep Australian biodiversity safe from weeds, feral animals, exotic pathogens and other invaders. We are a not-for-profit charitable organisation with over 2000 supporters. Our work is funded entirely by donations from supporters and philanthropic organisations.

Cover photos: Myrtle rust on scrub myrtle, Tim Low; Asian black-spined toad, DEPI; Yellow crazy ant, David Wilson; smooth newt, John Beniston (CC BY-SA 3.0); Koster's curse, Kim Starr; feral deer, Federation Training students.

# Contents

# Introduction: Biosecurity for a healthy environment

**The problem**

New types of foreign pests and weeds are getting into Australia every year. More than fifty new invaders harmful to the environment have been detected since 2000. Each new infestation that reaches our shores increases the cost of looking after the country's bushlands, seas and wildlife. And every failure to eradicate an infestation risks environmental problems of epidemic proportions, as these recent examples illustrate:

- Asian black-spined toads keep slipping through Australia's quarantine, to be found only by alert members of the public. These poisonous toads produce 40,000 eggs and could quickly devastate native wildlife in places not reached by cane toads.

- Red Imported Fire Ants are breaching our weak environmental biosecurity system. These ants swarm over parks and bushlands in huge numbers and attack Australian ground-dwelling birds, mammals, reptiles and frogs. A recent infestation in Sydney was stamped out, but a big incursion in SE Queensland has not been eradicated yet.

- A new fungal epidemic has stolen into the country putting gum trees, bottlebrushes and tea trees at risk. Myrtle rust, and other yet-to-arrive plant diseases, could hamper tree plantings and wreck the bush.

For many years Australia's quarantine and biosecurity systems have been focussed on protecting agriculture, trade and human health. But the impacts of invasive species on our natural environment can no longer be ignored.

**The solution**

Our environment, natural resources, native wildlife and wildflowers are what make Australia unique. Protecting these is in the public interest. This document shows how we can create a biosecurity system that's properly aimed at delivering real environmental protection on behalf of all Australians.

Figure one shows the structure of this document, with a healthy environment as the aim.

The underpinnings of a best-practice environmental biosecurity system are shown

Figure 1: A biosecurity system to deliver a healthy environment



| Healthy environment | |
|---|---|
| Manage invasive species | |
| Contain invasive species | |
| Eradicate invasive species | |
| Prevent invasive species | Foresighting; Preparedness; Surveillance; Prevention of incursions; Early intervention |
| Build capacity for success | Information & Research; Risk Assessment & Pathway analysis; Shared responsibility; Community engagement; Funding; Evaluation |
| Govern the system well | Transparency & Reporting; Inclusiveness; Decision making & accountability; Institutions; Legislation & regulations |
| Adopt strong principles | e.g: The precautionary principle; Timely action |
| Commit to public purpose | "Minimising the environmental impact of invasive species" |

as a commitment to public purpose and adoption of strong principles (detailed in Chapter 1).

Proper governance is the next element, to ensure that the system remains focused on its public purpose (Chapter 2).

With firm, purpose, principles and governance in place, we next need to build the system's capacity to succeed (Chapter 3).

Implementation is then described in Chapter 4, with sub-sections framed around the four phases of invasive species management (the "invasion curve"): Preventing new invasions; Eradicating species if possible; Containing species to limit their damage, and; On-going management of invasive species that are already established in the wild in Australia.

Figure one is reproduced at the start of each section of this guide with the relevant layer highlighted to help you navigate the document.

Towards the end of the document we have also included pointers on protecting ecologically vulnerable islands and marine areas from invasive species.

The ideas here apply equally at national, state and community level. They will be useful for revising regulations, drafting a submissions to policy reviews, or figuring out the best strategy to handle invasive species in a state or region. This guide explains what is needed to build a biosecurity system that protects nature itself.

# A best-practice biosecurity system

## 1. Commit to public purpose and adopt strong principles

Any policy, strategy, legislation or regulation relating to biosecurity or control of invasive species must include a statement of purpose declaring an intention to protect the natural environment from invasive species. A set of principles should be adopted to guide use of the system towards delivering environmental protection.
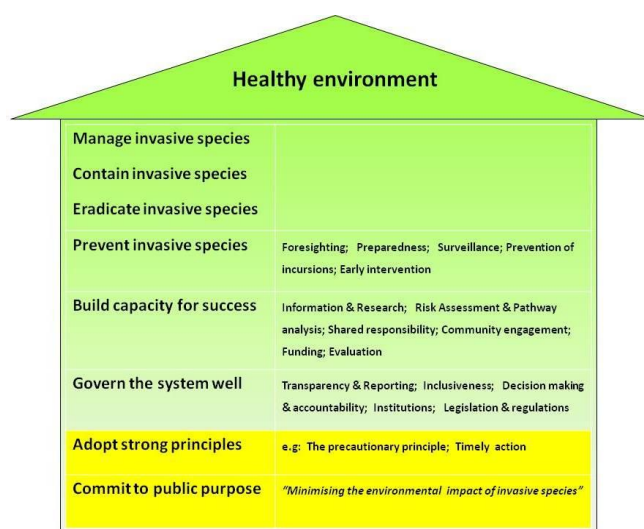


### 1.1 Purpose

A statement of environmental purpose should be modelled along the following lines:

> *To prevent the importation or incursion of new environmentally invasive species, and to reduce to a minimum the impact of invasive species on biodiversity, the environment and ecosystem function.*

Ideally, sub-objectives will also be included relating to the specific biophysical outcomes sought. For example, one might seek to:

- "Promptly eradicate all environmentally invasive species that evade prevention", and/or;
- "Contain the spread of invasive species to within their existing geographical range whenever reasonably practicable", and/or;
- "Reduce the number of highly invasive species that are established in the wild", or;
- "Produce a measureable reduction in the impact of invasive species on threatened flora and fauna".

### 1.2 Principles

The following principles must lie at the heart of any best-practice environmental biosecurity system:

- **Protecting the natural environment is core business**: The protection of biodiversity and ecosystem function is core business in any biosecurity or invasive species law and policy.
- **Prevention is smarter than cure**: Preventing new invasive species and new incursions is more effective and cheaper than attempting to address species at later stages of invasion.

- **Timely action is crucial**: The likelihood of success reduces, and the costs rise, the further a species gets along the "invasion curve". It is therefore crucial to make legislative, policy and budgetary provision for timely allocation of human and financial resources.

- **A precautionary approach is required**: Invasive species law, policy and practice must reflect the principle that a lack of full scientific certainty should not be allowed to delay action where there is a risk of harm to biodiversity.

- **Science-based risk assessment:** Risk assessments must form the foundation of decision-making. Risk assessments must be science-based, independent, transparent and precautionary.

- **All taxonomic groups are included:** All classifications of organism must be assessed and treated consistently, including all species, sub-species, cultivars and variants.

- **A tenure-neutral approach** should be taken to the management of invasive species' impacts on the natural environment.

- **Effectiveness rules**: Best-practice invasive species law and policy must drive towards clear, measureable outcomes (including biophysical outcomes) and must include means of evaluating and reporting on the effective and timely achievement of those outcomes in the near-term.

- **Future generations matter**: Subsequent generations of Australians should not inherit impacts or costs of avoidable failures in today's environmental biosecurity.

# 2. Govern the system well

Governance is about how decisions get made. It's about making sure the system's overriding purpose and principles are adhered to, so that environmental outcomes are actually delivered. Good governance of environmental biosecurity has the following elements.

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|---|---|---|
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## 2.1 Guarantee full transparency and comprehensive public reporting

People must be able to see and understand whether a biosecurity system is delivering adequate public good environmental outcomes. Ensuring open access to information and proper reporting on the governance, administration and implementation of biosecurity policy helps to achieve this transparency. This in turn helps to foster a culture of learning, so that improvements can be made over time.

### 2.1.1 Transparency

- All biosecurity risk assessments must entail public consultation and must be published in full

- Information about biosecurity decision-making, programs, projects, risk assessments, research, path-way analyses, interventions, listings and declarations, including the processes and reasons behind assessments and decisions, should be published on the internet. The information published must enable the public and stakeholders to understand and evaluate biosecurity decisions and performance

### 2.1.2 Reporting

- Annual reports should be published on the state of environmental biosecurity. These reports should include information about:
  - Known environmental biosecurity risks, and risk assessments in progress
  - Environmental impacts from invasive species
  - Incursions and incursion responses (e.g. eradication and containment projects)
  - Knowledge gaps and efforts made to fill these
  - Performance towards meeting strategic targets and objectives (including towards minimising the impact of invasive species on biodiversity and ecosystem function).
- Environmental biosecurity outlook reports should be published every two years, detailing pathway analyses, trend analyses and horizon scanning information.
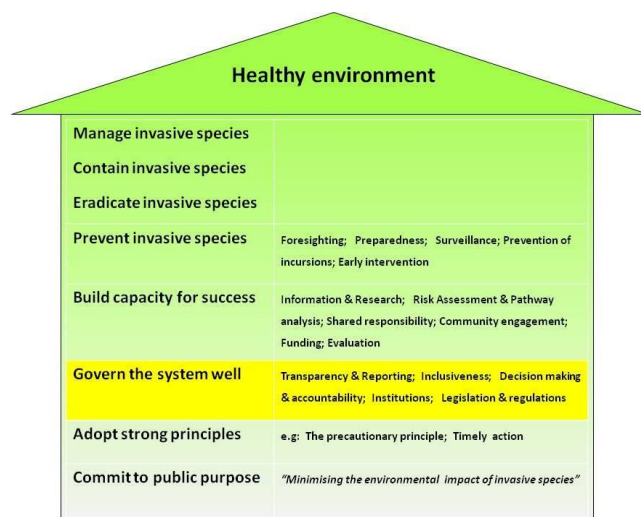
## 2.2 Include environmental experts and interests

Environmental departments, agencies, experts and interests must be properly consulted in all matters, involved in all advisory bodies and empowered in all decision-making regarding environmental biosecurity:

- All legislative and policy processes relating to environmental biosecurity should entail dedicated environmental advisory and consultative committees.
- Decision-making bodies that regularly handle environmental biosecurity issues (for example the National Biosecurity Committee) should have standing environment sub-committees able to co-opt expertise in ecology, biodiversity conservation, environmental land and water management and environmental biosecurity.
- Advisory committees relevant to environmental biosecurity must include environmental agencies, experts and interests.
- Consultative committees and processes relevant to environmental biosecurity must include:
  - the community environmental sector;
  - scientific experts in ecology, biodiversity conservation, environmental land and water management and environmental biosecurity;
  - Organisations responsible for management of relevant public and private nature conservation assets
- Inclusion of environmental experts and interests in decision-making, advisory and consultative committees handling environmental biosecurity must be equivalent to or greater than inclusion of other sectoral interests such as trade or agriculture.
- Where there may be conflicts between environmental interests and those of other sectors such as trade or agriculture, those potential conflicts should be made explicit and should be transparently resolved in the public interest.

See also the proposal to establish a new body, Environment Health Australia to promote engagement of the community and environment sector in environmental biosecurity (section 4.1.2).

## 2.3 Ensure proper decision-making and accountability

Responsibilities for administering and implementing environmental biosecurity law and policy must be clearly described. Decisions must be made and actions taken by the right person at the right time.

- State and national environment ministers must have prescribed roles in developing biosecurity laws, regulations, policies and strategies, in appointing advisory and consultative committees, and in determining priorities and guidelines. Where environmental biosecurity and environmentally invasive species are at issue, environment ministers should have primary decision-making authority.
- Laws, policies and cooperative agreements must specify one clear delegated authority responsible for making time-critical decisions relating to prevention and rapid responses. The

authority responsible for making these decisions must have adequate environmental expertise and cultural orientation towards addressing environmental biosecurity.

- Decision-making about which are the most important risks and priorities in environmental biosecurity must be based on transparent science-based risk analysis including application of the precautionary principle. (See section 4 for more detail on risk assessment)

- Clear arrangements for cooperation and policy coordination between state and federal governments should be described. Cooperation must not delay timely decision-making or obscure responsibility for action.

- Barriers to effective cooperative biosecurity (such as requirements for unanimous multi-party agreement on responses to environmental biosecurity threats) should be identified and avoided.

- Laws and policies should consistently reflect the Commonwealth's heads of power, and multi-lateral responsibilities, to take decisive and unilateral action about urgent environmental biosecurity matters especially in regard to prevention and early eradication.

- All governments must acknowledge that the Australian Government has the responsibility to act rapidly, adequately and unilaterally in the case of a national biosecurity emergency. The Australian Government may negotiate or require reasonable cost-recovery arising from unilateral emergency action, but cost sharing and cost recovery should not be negotiated or achieved at the expense of rapid emergency response.

## 2.4 Create dedicated institutions

The bodies that oversee biosecurity must have independence from sectoral interests and enough power to independently oversee the environmental biosecurity system in the public interest.

- A new federal Biosecurity Minister should oversee biosecurity legislation.

- The structure proposed by the 2008 Beale review of Australia's biosecurity system should be instituted, establishing a statutory National Biosecurity Authority, an expert Biosecurity Commission and an independent Director of Biosecurity.

- At least one-third of Biosecurity Commissioners must have primary expertise in disciplines relevant to environmental biosecurity, including ecology and biodiversity conservation, and be appointed by the Environment Minister, as recommended by the Hawke review of the EPBC Act.

- A new body, Environment Health Australia, should be established, as the environmental equivalent to the industry-focussed Plant Health Australia and Animal Health Australia (see section 4.1.2).

- A Biosecurity Minister should be created at state level

## 2.5 Enshrine effective legislation and regulation

### 2.5.1 Essential legislative provisions

The particular legislative provisions needed for effective environmental biosecurity include:

- Statutory objectives should be included relating to reducing the environmental impact of invasive species to a minimum (see section 1.1 above).

- Statutory principles should be included reflecting those in section 2.2 above.

- Reference should be made to the goal of ecological sustainability.

- Biodiversity laws (such as threatened species and environment protection laws) should include reference to the environmental biosecurity provisions in biosecurity laws.

- Provisions in threatened species legislation for the listing of processes that threaten biodiversity should be linked to biosecurity risk assessments. Threatened species legislation at state and national level must contain strong compliance and enforcement regimes, and mandate that public authorities must act promptly to reduce the impacts of listed threatening processes on biodiversity.

- National environmental biosecurity laws must reflect the Commonwealth's right to act unilaterally to uphold national responsibilities such as Australia's compliance with the United Nations Convention on Biological Diversity.

- National and state laws relating to regulation of biosecurity and trade can and should be harmonised in a way that incorporates the precautionary principle while also aligning with the rules of the WTO Sanitary and Phytosanitary (SPS) Agreement.

- Provisions must be made to require that transparent science-based risk analysis is the basis of national Biosecurity Import Risk Analyses (BIRAs) and of prioritisation of BIRAs.

- Legislation and regulations must not make environmental biosecurity action dependent on positive cost-benefit analyses, as environmental values, costs and impacts are prohibitively difficult to quantify and compare.

- Legislation must express and consistently reflect Australia's Appropriate Level of Protection under the SPS agreement, of: "providing a high level of sanitary and phytosanitary protection aimed at reducing risk to a very low level, but not to zero".

- Legislation should require everyone (including individuals, companies, government agencies and public authorities) to take all reasonable and practical steps to prevent and minimise harmful or potentially harmful invasive species' impacts on the environment. (Such provisions for shared responsibility underline governments' primary responsibilities for delivering public good environmental biosecurity outcomes).

- Provision must be made for public access to judicial and merits review of environmental biosecurity decisions, affording the public and environmental stakeholders the right to have decisions reviewed both on their merits and on the legality of the decision-making processes.

- Legislation should specify the transparency and reporting arrangements in section 3.2 above.

### 2.5.2 Effective regulation

Strong regulation is an essential part of an environmental biosecurity system, and is particularly important in prevention and early intervention. Particular regulatory provisions should include:

- "Permitted lists" of species that are known to be safe following consistent science-based risk analysis: Only listed species should be allowed to be introduced, sold, moved or kept. This default defensive position is the best way to prevent new invasive species.

- Declarations including pest declarations, made consistent with science-based precautionary risk analysis, and able to be made at the appropriate scale(s) to assist prevention eradication and containment- allowing different responses at increasing distances from an incursion and effective arrangements across administrative boundaries.

- Phasing out of the keeping, trade or movement of known invasive species, with decisions and actions based on each species' degree of invasiveness.

- The listing as biosecurity entities of those who sell potential aquatic pests other than species assessed as having a very low biosecurity risk. Biosecurity entities dealing with the trade of aquatic species must be required to display signs warning against the disposal of fish, snails and plants in waterways and suggesting safe alternatives.

# 3. Build capacity for success

## 3.1 Develop adequate information and research

Strong environmental biosecurity can only be achieved with adequate accessible information and targeted research.

### 3.1.1 Information

A strong information system will include:



- A public, national priority list of invasive species not yet established in Australia that are of environmental biosecurity concern

- A national priority list of invasive species already established in Australia ranked by degree of environmental invasiveness, and annotated with species' regulatory status by jurisdiction

- Nationally agreed protocols for collection and supply of data on interceptions and incursions, and a national publicly accessible database on interceptions, incursions and responses.

- A national geospatial data portal for invasive species distribution and abundance relative to environmental and biodiversity assets

- A national database of seized exotic wildlife

- A national database of risk assessments of environmentally invasive species

### 3.1.2 Research

Research needs include:

- Establish a national research centre for environmentally harmful invasive species, focussed on prevention and early action- the cost-effective prevention end of the invasion curve. ,Some work can be undertaken on management of invasive species that have environmental impacts where this seeks to develop innovative solutions to reduce impacts.

- Fully fund implementation of the National Environment and Community Biosecurity Research, Development and Extension Strategy, and ensure its regular review and revision.

- Develop a systematic monitoring system for invasive species and their impacts on the environment, including the marine environment

- Examine the predicted effects of climate change on the future spread of invasive species, their environmental impacts and interactions with related phenomena such as shifting patterns of land use
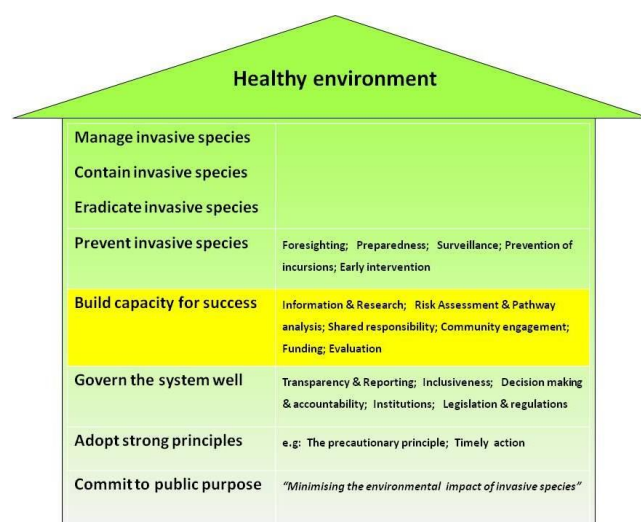
- Provide adequate funding for research into safe biological control agents for environmental weeds and pests.
- Conduct social research into the behaviours of those who deliberately or unwittingly spread pests, to guide policy responses

## 3.2 Conduct thorough risk assessment and pathway analysis

Risk assessment and pathway analysis are complementary elements of an ideal biosecurity system: risk assessment provides an understanding of the likely invasiveness and impact of species that may arrive, while pathway analysis gives insight into the means by which species may arrive.

### 3.2.1 Risk assessment

Science-based risk assessment is a fundamental element of good environmental biosecurity. Risk assessment, along with analysis of the likely pathways that species may follow when invading, helps to enable policy development and implementation consistent with Australia's needs and obligations.

For example, Australia has a defined Appropriate Level of Protection (ALOP- the degree of protection from biosecurity risks considered appropriate for a country) under World Trade Organisation protocols. Australia's ALOP is expressed as "providing a high level of sanitary and phytosanitary protection aimed at reducing risk to a very low level, but not to zero". This risk setting was chosen principally with trade and agriculture in mind, whereas an appropriate risk setting relating to environmental biosecurity should be lower still- approaching zero.

Australia is a party to the United Nations Convention on Biological Diversity (CBD) which commits us to "Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species" (CBD article 8h). The convention's preamble and guidelines prescribe a precautionary approach wherein all risks posed by invasive species to biodiversity- not just higher level risks- should trigger preventative action or early eradication, or where these are not able to be achieved, containment of invasive species.

The only way to comply with these protocols and obligations is to properly assess the risks from potentially invasive species so that those which pose anything but an extremely low level risk to the environment can be prevented, eradicated or managed according to the risk they pose.

Best practice environmental biosecurity risk assessment must:

- Be a statutory (legal) requirement
- Be based on scientific evidence
- Be consistently applied both to exotic taxa and to invasive and potentially invasive species already in Australia.
- Take a precautionary approach
- Recognise changes through time, to require that risks are assessed over an ecologically relevant time frame taking account of climate change

- Include the likelihood of new genotypes or varieties of an introduced organism combining with existing genotypes to exacerbate the potential for the disease or pest to cause environmental harm.

- Recognise regional ecological differences and different levels of biodiversity (ranging from ecosystem to genetic level).

- Be decided by independent expertise-based bodies or committees (for example the Biosecurity Authority proposed by Beale) that include sufficient independent people with expertise in environmental biosecurity and ecological science

- Be developed through a transparent process, and open to public scrutiny through on-line publication of draft and of final risk assessments and of subsequent decisions.

- Allow for the public to make proposals to the committee about taxa warranting risk assessment and about the level of risk that might be accorded to taxa

While the assessment of the degree of risk that a taxon poses must be made independently based on scientific evidence, subsequent decisions about policy implementation and action (based on the assessed risk) would appropriately be made by the responsible party (often a minister of government or their delegate). Any such decisions that are not made in accordance with the independent risk assessment must be required to be publically reported along with the reasons for those decisions.

A very low threshold of risk should be applied in decisions about exotic species and species not yet established in the wild in Australia. Only organisms assessed as very low risk to the environment should be permitted to be introduced into Australia, or if already present but not yet established in the wild, to be managed such that they may risk being established in the wild.

Higher levels of risk may be acceptable in decision-making about control of invasive species that are already established in the wild in Australia, with greater priority for control and management placed on species with higher levels of independently assessed risk.

### 3.2.2 Pathway analysis

Figuring out which human activities have caused previous invasions helps us learn from our mistakes and oversights. Pathway analysis looks at the ways different species have got to Australia as well as their taxonomy, invasiveness and origin. This helps to identify weaknesses and gaps in the biosecurity system and to define trends. As Australia faces an overwhelming number of species that may arrive here and harm the environment, identifying potential pathways and striving for improved pathway hygiene is a strategic way of lowering the risk of new invasive species. A best-practice environmental biosecurity system would include:

- Regular systematic analysis of the pathways of introduction of environmentally invasive species, with priorities based on the degree of risk that taxa pose to the environment.

### 3.3 Share responsibility

Protecting the environment from the impacts of invasive species can be seen as the responsibility of all Australians. This sense of shared responsibility underlines the responsibility of our governments

to address invasive species issues on behalf of the public whom they represent and serve. It can also prompt greater participation in environmental biosecurity activities like planning, surveillance and pest management, so increasing the effort and resources applied to these tasks. Shared responsibility may be encouraged and reflected in policy through:

- A statutory duty of care or "general duty" to take all reasonable steps to prevent, eradicate, contain or control invasive species.

- Empowering and supporting the community to become more actively engaged in invasive species policy development, decision-making and action (see also section 3.4, Community engagement).

- A system of rewards, supports and penalties for respectively exceeding, fulfilling, or failing to fulfil one's responsibility. (such a system could extend to state governments, with Australian Government funding made dependent on states' achieving environmental biosecurity performance standards)

- Strong public education about environmental biosecurity

## 3.4 Engage and educate the community

Best practice environmental biosecurity requires strong community engagement and education. The environmental sector includes many people and organisations whose intellectual and physical resources can add capacity in areas like surveillance, innovation, and management.

Community engagement both within the environment sector and with the general public should occur at a range of different levels, from informing people of decisions and actions, through consulting with them, fostering their deeper involvement, and where appropriate empowering them as central players in the environmental biosecurity system.

Real community engagement at all these levels requires that the community are supported with education, training, incentives, facilitation and coordination of their engagement towards strategic goals.

The realisation of a shared responsibility for environmental biosecurity can only be achieved with adequate investment in community education and engagement. Adequate public funding for environmental biosecurity will only be achieved with an engaged and supportive polity. Therefore community engagement and education in environmental biosecurity must be adequately reflected in all relevant budget lines.

## 3.5 Provide sufficient timely funding

Australia's commitment to reduce environmental biosecurity risk to a very low level requires a concomitant commitment of funding. By and large this must come from the public purse, as environmental outcomes are "public goods".

Governments' have principal responsibilities for delivering public goods. While "polluter pays" and "beneficiary pays" principles can be applied to some aspects of environmental biosecurity, in practice these are difficult to implement. Governments have the leading responsibility for funding delivery of environmental outcomes through the system.

It is critically important that preventative actions and rapid responses to environmental incursions not be denied or delayed merely because of doubts about funding responsibility, or because of cost-sharing disputes.

Greater certainty is needed in the provision of environmental biosecurity response funding, especially for actions that are time-critical.

Increased, adequate investment must also certainly be made in day-to-day prevention, contingency planning, research, surveillance, community education and engagement, to overcome the disparity between funding of industry-focussed biosecurity and environmental biosecurity.

Funds are also needed for targeted actions to reduce the impact of established invasive species.

Budgeting for environmental biosecurity and invasive species management should be based on transparent assessment of the resources required to meet declared policy objectives. Any gap between funding available and funding needed to achieve policy objectives should be clearly described in annual state of biosecurity reports.

All options for provision of adequate funding should be explored. These may include, for example:

- Low-interest loans for invasive species management;
- Beneficiary pays mechanisms (e.g. tourism levies; fisher levies)
- Polluter pays measures (e.g. bonds, fines and cost-recovery measures)
- "Future Fund"-style dedicated contingency funds
- Biosecurity levies
- Inter-departmental, whole-of-government and/or intergovernmental partnerships, recognising the cross-sectoral public good value of improved environmental biosecurity.
- Consolidated revenue (with costs managed by focussing heavily on prevention and early intervention, and by driving towards delivery of measurable environmental outcomes)

## 3.6 Evaluate the system's effectiveness

Evaluation of the effectiveness of policies programs and of the overall system in reaching environmental goals must be an integral part of the system. Information that is generated about environmental biosecurity must be gathered, compiled and analysed so that progress towards the system's goals can be assessed. On-going evaluation will inform continuous improvement in policy and implementation- increasing the likelihood that goals may be achieved. It will also form the basis of a sound reporting system. Systematic evaluation also enables adequate resource allocation and budgeting, and reflects proper fiduciary practice.

# 4. Implement the system with the invasion curve in mind

Environmental biosecurity should be implemented strategically so that effort and resources reduce the impacts of invasive species on the environment to the greatest extent possible. To achieve this, actions should be framed in relation to the notional environmental invasion curve represented in figure two.



This invasion curve is based on long experience showing that protecting the environment becomes increasingly difficult as more and more environmentally harmful invasive species first enter, then gain a foothold, and spread to become more firmly entrenched in an area.

This tells us that effectiveness will be relatively greater when efforts are focussed on the early stages of the invasion curve.

*Figure 2: Notional environmental invasion curve concentrating on ecological process and impacts*
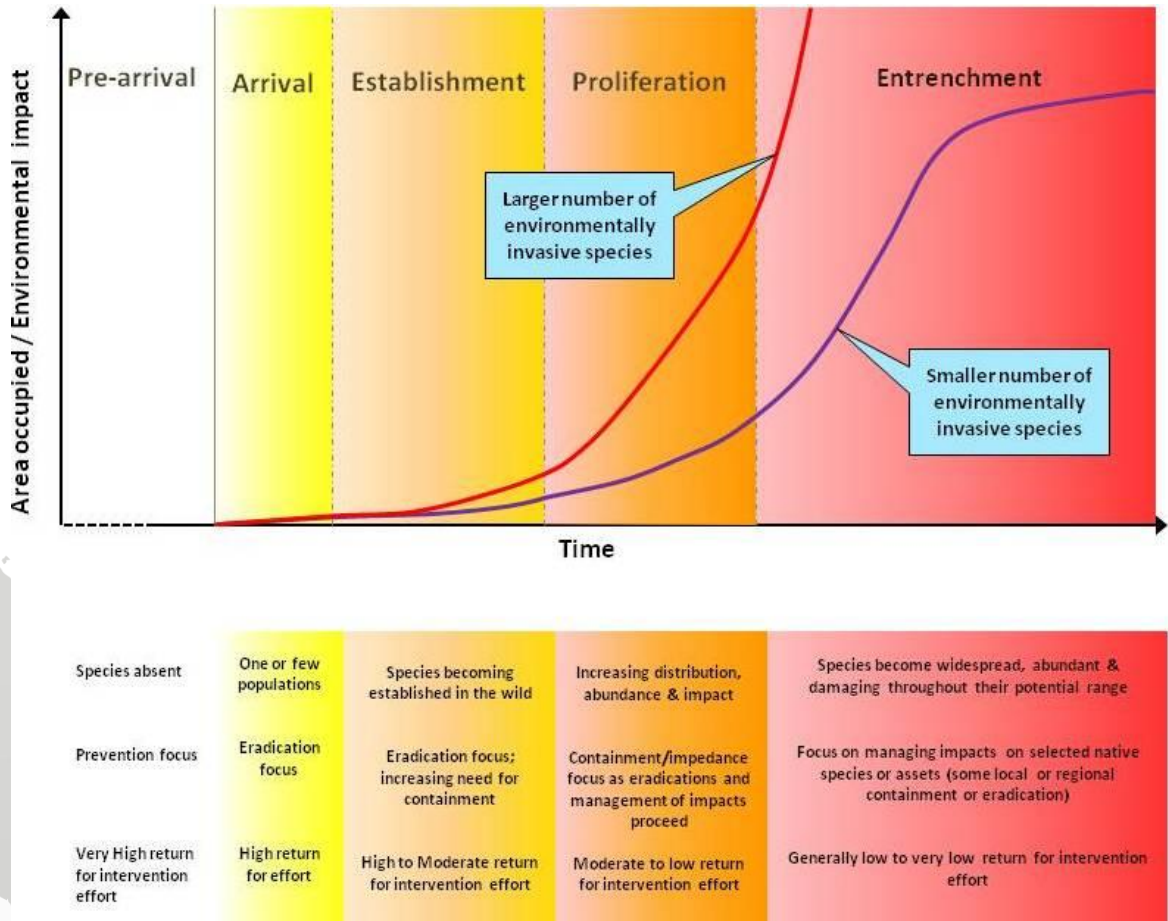
## 4.1 Prevent invasive species

A strategic approach to environmental biosecurity will place great emphasis on prevention, the most cost-effective end of the invasion curve. Effective prevention of invasive species requires good foresight, preparedness and surveillance, then prevention of incursions and where that fails, early intervention.

### 4.1.1 Foresighting

Anticipating future occurrences enables us to prepare for them. Foresighting increases the range of environmental biosecurity threats that we are able to foresee.

- An environmental biosecurity foresighting unit must be established within the federal environment department as recommended by the 2009 Hawke review of the EPBC Act

- Foresighting responsibilities within state governments should be clearly delegated

- Horizon scanning should be conducted periodically to identify and rank future biosecurity threats to the environment. This should be done through a transparent process involving all relevant experts.

- Particular attention in foresighting should be paid to monitoring:
  - Trends in the aquaculture and aquarium industries
  - The pet industry
  - The plant nursery industry
  - Animal husbandry
  - The effect of changing climate on the ecology of invasive and native species and on land use
  - Internet trade

### 4.1.2 Preparedness: Establish Environment Health Australia

Preparedness can ready us for both known and unanticipated environmental biosecurity threats. Preparedness is a collaborative process requiring engagement, communication and action among all relevant players.

Preparedness for agricultural biosecurity threats is promoted through the industry-government partnerships of Plant Health Australia and Animal Health Australia. There is a need for a similar body to promote collaborative preparedness in environmental biosecurity.

A new body, Environment Health Australia (EHA), is proposed to undertake this role. EHA would bring together major participants in environmental biosecurity, involve the community sector, and facilitate cross-jurisdictional, cross-sectoral collaboration. More specifically, EHA would:

- Improve Australia's biosecurity preparedness, for example by developing contingency plans and surveillance protocols, and conducting foresighting

- Promote effective responses to environmental invasions, including by developing emergency response plans and facilitating training

- Enhance community awareness, vigilance and action in environmental biosecurity
- Strengthen the foundations of environmental biosecurity by promoting more ecologically informed approaches to biosecurity drawing on the environment sector's specialist expertise
- Improve environmental biosecurity capacity, including by identifying research and capacity needs and acting as a clearing house for information
- Improve relevant coordination and collaboration within the environment sector and between jurisdictions, agencies and sectors
- Monitor and report on progress in environmental biosecurity

As protection of the environment is in the public interest, funding for the establishment and operation of EHA should be provided by state and Federal governments (with an estimated cost of $20 million over five years).

### 4.1.4 Surveillance

Strong surveillance programs are essential to detect any invasive species that evade prevention.

- Specific surveillance programs should be established for high risk species and priority pathways
- Community mobilisation programs should be used to assist with surveillance efforts
- Marine pest surveys should be conducted at major marine ports of entry at least every five years.
- Periodic audits should be conducted of environmental biosecurity surveillance programs in Australia, to determine gaps in surveillance in relation to high risk species and high priority pathways.

### 4.1.3 Prevention of initial incursions

These specific policy measures can help prevent initial entry into Australia, or incursion into new areas, of invasive species through likely pathways.

- Ensure that import risk analysis is directed to the highest priorities, including environmental priorities, by establishing a transparent prioritisation process based on degree of risk.
- Actively screen known likely pathways and vectors for environmental invasions, with on-ground screening priority based on risk
- Provide for periodic independent expert review of recent incursions and interceptions, to produce recommendations for addressing those incursions, to inform future risk assessments, pathway analyses and planning, and to make recommendations for reducing the risk of future incursions.
- Develop contingency plans in readiness for the potential arrival of high priority invasive species.

- Develop and implement a national plan to reduce the biosecurity risks of both legal and illegal keeping of exotic fish, birds, mammals, reptiles and amphibians.

- Improve the control of illegal importation of wildlife by:

  o Establishing a national network of wildlife crime investigators and crime intelligence analysts supported by a wildlife crime intelligence database.

  o Conducting public education about wildlife crime, including through publicising arrests and seizures.

  o Establishing and promote a national reporting system for wildlife crime.

  o Providing funding for forensic analysis of DNA for wildlife crime investigations.

  o Conducting a risk analysis of illegal smuggling and keeping of wildlife and developing a compliance strategy to target these crimes.

  o Conducting an audit of internet sales of organisms not permitted in Australia and developing a compliance strategy to stop illegal internet sales.

  o Reviewing the adequacy of penalties available and applied for crimes relevant to environmental biosecurity, and educating the judiciary on the serious biosecurity consequences of wildlife crimes.

  o Developing a program similar to that of the Scottish Partnership for Action against Wildlife Crime which involves government agencies, NGOs and the community working together to combat wildlife crime.

- Conduct an audit of diagnostic capacity within Australia for priority environmental disease and pest categories. Develop a strategy to fill gaps in diagnostic capacity. Develop diagnostic protocols for priority environmental threats.

### 4.1.5 Early intervention

If an invasive species evades prevention, rapid action to stop the invasion is critical. Early intervention requires prompt decision-making, ready access to funding and resources, and a commitment to best-practice eradication effort as described in section 4.2. Dedicated funding is needed to enable rapid intervention when required. It is important to learn from each intervention so that improvements can be made.

- Establish a national emergency and rapid response fund that can be used to fund immediate and short-term emergency responses to environmental biosecurity events. Establish clear multi-jurisdictional protocols for use of these funds that ensure immediate access to funding for time-critical environmental biosecurity responses. Protocols should recognise the Commonwealth's heads of power to take emergency action under multi-lateral agreements in the national interest. A longer-term funding mechanism must also be provided to guarantee stable funding of important eradication programs.

- Conduct an open review of each environmental biosecurity incursion response, and make these reviews publicly available on the internet.

## 4.2 Eradicate invasive species

Eradication is the strategic response to invasive species that have evaded prevention, are established in the wild but are not yet widespread. The longer the time-lag between a species evading prevention and the commencement of eradication efforts, the less likely eradication is to succeed. Timeliness of resource allocation and action are therefore of great strategic importance here.

- All new incursions of species not yet established on a widespread basis in the wild in Australia, other than those that are assessed as having only a very low risk to the environment, must be eradicated.

- Eradication should also be applied to existing incursions of species that cover a limited area and are not yet widespread, with priorities for eradication based on a species' assessed risk to the environment. Lower priority species not subject to immediate eradication should be contained to limit their spread (see section 4.3).

- Decisions about eradication priorities and the feasibility or eradication must be made rapidly, publically, on a precautionary basis and subject to peer review.

## 4.3 Contain/impede the spread of invasive species

Containment is often a strategic part of eradication programs, limiting the spread of species while eradication takes its course. Containment or partial containment is also important where a species has evaded prevention, is established in the wild and becoming widespread (beyond the likelihood of eradication), but where it has not yet reached the full extent of its potential range.

Containment or impedance of species is important in managing the impacts of invasive species by limiting their geographic extent or rate of spread. This can protect environmental assets beyond a species' existing range and provide time to develop new or improved control techniques. It may also provide time for native species to adapt to an invasive species' behaviours or impacts.

Containment should:

- Be based on a containment plan delineating the current range of the species and the area within which it is to be contained

- Include provision for on-going monitoring of the species' range and abundance, and surveillance to discover any breaches in containment.

- Allow for adaptive management to take advantage of any environmental or technological opportunities to reduce the containment area or to switch to an eradication program if conditions or technologies allow this

- Include provision for regular review and revision

## 4.4 Manage the impacts of invasive species

On-going management of the impacts of environmentally invasive species is necessary when prevention and eradication are not possible. Management of impacts is also important within containment lines. Best-practice invasive species management should entail the following:

- Clear planning to identify the likely impacts of a species on different aspects of the environment including threatened species and communities, ecosystem functions, and

interactions with other processes that threaten the environment, like soil erosion and promotion of other pests and weeds.

- Biophysical targets for reducing the impacts of invasive species to a minimum, along with clear responsibilities for achieving targets, and processes for evaluation, review and adaptation of plans to improve effectiveness.

- Use of all available means of humane invasive species control necessary to achieve environmental outcomes, including lethal means as necessary.

- Use of all available evidence (as well as application of the precautionary principle) in choosing control techniques. Where full evidence is lacking for a proposed control technique, that technique should be introduced as an experimental pilot under controlled circumstances in limited geographic areas.

- Avoidance of specious control strategies that have no proven effectiveness.  For example recreational hunting of feral animals, and bounty schemes, have each been shown to have a negligible effect on pest animal populations and impacts, and should not be adopted as management techniques.  Similarly, approaches driven by commercial markets for invasive species have commonly been ineffective and at times can actually limit the *control* of invasive species, instead of limiting their impacts.

- Alertness to the ecological context of the invasive species at issue and the potential merit of manipulating predator-prey relationships and other aspects of ecology in addressing the ecological impacts of invasive species.

- Adoption of the most humane methods of pest control under proper animal welfare protocols. Animal welfare considerations should include the possibility that:

    o Killing a smaller number of animals early can be far kinder than having an increased population of animals starving later because they have run out of food

    o Larger culls may become necessary when populations grow to become more environmentally damaging

    o The welfare not only of pest animals, but of native animals impacted by their predation, competition or ecological effects must be taken into account

# A note on ecologically vulnerable areas

## Islands

Australia's islands are important environmental assets that are highly vulnerable to invasive species, and so rigorous biosecurity for islands is a high environmental priority.

Eradication of pest animals from near-shore and offshore islands is a very effective pest control measure. Once such island eradications have been successfully effected their benefits should be secured by declaring biosecurity zones, so that the efforts of eradication are not undermined by subsequent incursions. The following specific policy measures should be adopted.

- Develop a National Island Biosecurity Initiative to prevent new invasions of offshore islands like Lord Howe Island. This initiative should entail:
  - close involvement of island communities in development of the initiative
  - establishing biosecurity priorities for all islands based on their ecological values and on risk assessment
  - developing biosecurity management systems for all islands, with individual biosecurity management systems for high priority and high risk islands
  - conducting regular surveillance of high and medium priority islands
  - developing best practice biosecurity approaches for island managers
  - establishing ready response capability for islands
  - developing community support for improved island biosecurity

  In the absence of such a national initiative, the above measures should be developed for individual islands by or in partnership with their respective island community

- Establish a category of statutory biosecurity zone for high value conservation areas with high biosecurity risks, to be known as 'conservation biosecurity zones', as the basis for implementing biosecurity measures, plans and monitoring for islands (and other high conservation value sites).

# The marine environment

Australia's marine and estuarine environments include many unique species, and sites of high conservation value. Invasive species can reach our marine environments in ships' ballast water and by travelling on the hulls of vessels. Like on land, once established, invasive species can be very difficult to manage in the marine context. Impacts include direct predation on indigenous marine species, displacement and competition with local species and changes to the ecology of marine environments.

Once in Australian waters the risk of further incursions brought about by the spread of species within Australia must be managed. Therefore not only international, but domestic movement of potentially invasive species must be managed carefully. Some specific policy measures that are needed are:

- Australia should embrace the International Maritime Organisation's Ballast Water Convention and ensure that national legislation reflects it.

- All state and territory governments should adopt ballast water regulations covering international and domestic traffic, to consistent high standards.

- Australia should make statutory provision for mandatory adoption of IMO Guidelines on biofouling, and adopt a national regulatory approach to biofouling, covering both international and domestic traffic.

- All state and territory governments should adopt biofouling regulations covering international and domestic traffic, to consistent high standards.

- The federal Biosecurity Act should be extended to cover all of Australia's external territories (other than the Antarctic)

- Priority marine invasive species should be used as indicator species for gauging the effectiveness of methods for managing hull fouling and ballast water incursions.

# Conclusion

Australia's biosecurity system has been focussed on protecting trade and agriculture rather than the environment. This has placed the country's wildlife, native trees and wildflowers, national parks and natural areas at risk. In turn this threatens the country's recreational amenity, lifestyle and nature-based tourism assets.

There are many things that can be done to improve the situation. This paper attempts to compile these ideas as a guide to creating a best practice environmental biosecurity system.

Use of this guide by all people with interests in environmental biosecurity and invasive species management will see a rapid and consistent improvement in the nation's environmental health.

To get a deeper understanding of some of the ideas in this guide, you can read the Invasive Species Council's submission to the 2015 Senate inquiry into environmental biosecurity.

# Glossary

**Asset protection**

Invasive species management aimed at minimising impacts on specific environmental assets such as populations of threatened species or sites of high biodiversity.

**Ballast Water**

Fresh or salt water, sometimes containing sediments, held in tanks and cargo holds of ships to increase stability and manoeuvrability during transit

**Biodiversity**

the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems

**Biofouling**

The undesirable settlement and growth of microorganisms, plants, algae, and animals on submerged structures, especially ships' hulls. Biofouling also occurs on the surfaces of living marine organisms

**Biophysical**

Relating to the physical stuff of the environment, whether living (animals, plants) or non-living (e.g. water regimes; nutrient flows)

**Biosecurity**

The management of risks to the economy, the environment and the public that arise from the entry, establishment or spread of invasive biota (including all taxonomic groups and levels).

**Biota**

The animal and plant life of a particular region, habitat, or geological period

**Containment**

Limiting the geographic expansion of an invasive species' range

**Diagnosis**

Analysis to determine the nature of a suspected invasive disease, pest or weed

**Duty of care**

A term whose meaning depends heavily on context. A duty of care can be formally described in law, such as in the NSW Biosecurity Act. It can also or alternatively be induced from the accumulated rulings made in common law. Duty of care is also a vernacular expression that may have no legal meaning in some contexts. For example, the section 22 of the Biosecurity Act 2015 (NSW), describes a General Biosecurity Duty like this: "Any person who deals with biosecurity matter or a carrier and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised".

**Ecosystem function**

An intrinsic ecosystem process whereby an ecosystem maintains its integrity. Ecosystem processes include species interactions, decomposition, production, nutrient cycling, and fluxes of nutrients and energy

**Ecological sustainability**

This term refers to maintaining the health of ecosystems. One suitable definition might be "The maintenance of biodiversity, ecosystem function and resilience over the long term".

**Environmental biosecurity**

Biosecurity aimed at the protection of biodiversity and the natural environment.

**Eradication**

The extirpation of an invasive species from an area

**Exotic**

Originating in or characteristic of a foreign country

**Foresighting**

The application of forward-thinking methodologies to improve institutional planning or policy making for potential future situations, hazards or opportunities.

**Horizon scanning**

A specific foresighting methodology that uses various steps to identify issues at the edge of current thinking that may have significant impact in the medium to long term future

**Incursion**

An invasion or attack, especially a sudden or brief one

**Invasion**

The process by which species may enter areas outside of their natural range, spread further into to new areas and establish self-sustaining wild populations

**Invasive species**

Invasive species are animals, plants and other organisms (exotic or native) that are introduced by human agency, directly or indirectly, to places outside their natural range where they reproduce and spread, often threatening indigenous species and compromising ecosystem functionst

**Pathway analysis**

Examination of the ways that different species have invaded an area, as well as their taxonomy, invasiveness and origin.

**Prevention**

Action or actions aimed at stopping invasive species from initially entering an area

**Principle**

An important underlying law or assumption required in a system of thought

**Policy**

A course or principle of action, adopted or proposed by a government, party, business or individual

**Regulation**

An official rule, guideline, or order stating what may or may not be done or how something must be done under the provisions of a piece of legislation (a law).

**Taxonomy**

A system of nested categories (taxa) reflecting evolutionary relationships or morphological similarity

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