PII Resource Kit for Rodent and Cat Eradication Introduction

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PII Resource Kit for
Rodent and Cat Eradication
This kit provides project managers with a practical guide
to help plan and implement rodent and cat eradication projects.
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Introduction

About PII

The Pacific Invasives Initiative (PII) is a leading capacity development organisation for invasive species management in the Pacific region.

PII has worked with Pacific agencies (both government and non-government organisations (NGOs)) to strengthen their capacity for managing invasive species since 2004. Building long-term institutional relationships with agencies to empower confidence and encourage self-reliance is an essential component of our capacity development work.

More information on the PII and its work can be found at: www.pacificinvasivesinitiative.org

Purpose of the Resource Kit

Over the previous decades, the eradication of rodents and cats has become an established management tool in the fight against the impacts of invasive species on island biodiversity. Worldwide, there have been reports of 332 successful rodent eradications from 284 islands. In 1925, Stephens Island, New Zealand was the site of the first reported successful eradication of cats from an island. By 2004, 48 successful cat eradications had been reported around the world.

The PII Resource Kit provides project managers with a systematic approach to planning and implementing rodent and cat eradication projects on islands in the Pacific.

The need for the Resource Kit came from PII's experience working on invasive species projects with Pacific agencies. Because invasive species management is a relatively new tool for island restoration in the Pacific, a common constraint for agencies was access to an authoritative and consistent process and a source of information to effectively address the complexity of invasive species management.

To address this need PII, in collaboration with world leading eradication experts, developed a stepwise process and supporting tools to provide project managers with access to current eradication best practice. Use of the Resource Kit will give Pacific agencies the ability to embark on their invasive species management projects with greater confidence of achieving their desired island restoration goals.

Scope of the Resource Kit

The Resource Kit focuses on eradicating rodents and cats from islands in the Pacific. Why rodents and cats? They are the two greatest threats to island biodiversity. Also, experience with eradicating rodents and cats from islands in temperate and sub-Antarctic regions has provided a suite of proven techniques that can be adapted for eradication projects on tropical islands.

The Resource Kit focuses on eradication because, if feasible, eradication is a better long-term solution than control.

The Resource Kit is targeted at eradicating rodents and cats, but the process and many of the supporting tools, can be adapted to the eradication of other invasive species. Likewise, the Resource Kit will be of use to project managers working on islands in regions outside the Pacific.

Eradicating invasive species from islands is not an end in itself, but is rather a tool used to pursue a larger conservation management outcome. Hence, eradication projects are usually undertaken as part of larger conservation plans. While appreciating the wider context, the Resource Kit focuses on supporting project managers being successful in the eradication phase of the plan. It is intended that the implementing agency ensures that the eradication project fits in with their broader longer term conservation plans.

How the Resource Kit was developed

The Resource Kit was designed by combining PII's experience working with Pacific agencies with existing eradication best practice. PII have actively involved eradication experts and potential Pacific users throughout the development of the Resource Kit to ensure the content is both accurate and relevant.

Invasive Species Management Options

There are four options for managing invasive species

1. **Prevention** – Prevention is better than cure. Stopping the spread of an invasive species to an island is generally the most cost-effective management option. This means that the invasive species will not be able to cause damage to the island and the need for eradication and restoration work is avoided. Preventing invasions of new invasive species should be the highest management priority even where islands already have some invasive species established. If an invasive does slip through, the focus then is on early detection and rapid response to prevent the new invasive from establishing a population.

2. **Eradication** – Eradication involves the complete removal of all individuals of a targeted invasive species population from an island. If feasible, this option offers a permanent solution if supported by biosecurity measures.

3. **Control** – Control involves containing the distribution and/or reducing the abundance of a targeted invasive species to below pre-set levels and for defined periods, so that impacts are acceptable. Control is the next preferred option when eradication is not appropriate or feasible.

4. **No action** – The 'do nothing' option. Could be justified if -

    - The costs of management action outweigh the benefits e.g. it costs more to control invasive species on a crop than the value of the crop itself or -
    - Effective actions are not feasible or -
    - There is likely to be minimal impact on conservation or livelihood values.

Eradication vs. Control

To help decide between the suitability of an eradication or control approach the table below provides a detailed comparison.
Note: The table has been used for invasive mammal species in New Zealand, and is adapted from Beaven (2008).

Feature	Eradication	Control
Definition	The permanent removal of the entire population of an invasive species from an island. Usually a one-off operation done over a set period of time, and often at the time of the year when invasive species are most vulnerable to the methods being used.	The impacts of invasive species are managed by ongoing removal of the population, rather than eliminating every animal. Control is normally undertaken frequently, e.g. seasonally before a threatened species breeds.
Feasibility	Essentially only feasible on islands or behind pest-proof fences where the risks	Potentially feasible at any defined site, but generally limited in size, especially

	of reinvasion are relatively low or can be managed.	for rodents. Continual reinvasion from outside the controlled area is a problem.
Project area	The whole project area must be comprehensively treated.	Specific areas can be targeted, and these can vary according to need.
One-off vs. continual	A one-off project with ongoing surveillance and management of reinvasion risks.	Continual management and monitoring required because if the management stops the benefits are lost.
Biosecurity	Ongoing biosecurity measures required to prevent re-invasion.	On-going biosecurity and contingency measures (for targeted species) not necessary.
Investment	High initial investment, followed by relatively low ongoing inputs (depending on the scale of ongoing biosecurity requirements).	Generally low-medium, but ongoing, investment. Potentially high long-term cost. Can be difficult to sustain with community projects.
Benefits	Significant potential benefits which improve over time. Benefits continue indefinitely if biosecurity measures maintained.	Variable benefits dependent on effectiveness of control regimes. Benefits are lost as invasive species populations rebuild if control methods are stopped.
Toxins and traps	Short term pulse of toxin or trapping, restricting the period in which there may be effects on non-target species.	Multiple, long-term use of toxins or traps increases the potential for harmful effects on non-target species. Continuous control requires the careful management of non-targeted effects, which can constrain the type of control tools used.
Adapting	Target invasives do not have time to adapt to the methods used against them.	Target invasives can potentially adapt to control methods making the control less effective over time.

Benefits of Eradication

The importance of island biodiversity

Islands are global biodiversity hotspots. While accounting for less than 3% of the Earth's land area, they are home to 20% of all bird, reptile and plant species. Moreover, a high proportion of species on islands are endemic i.e. not found anywhere else in the world. This makes Pacific islands key to preserving global biodiversity.

In addition to their unique terrestrial biodiversity, Pacific islands also support large colonies of nesting seabirds and migratory shorebirds of which many are threatened or near-threatened. Seabirds are a key link between the marine and terrestrial environments. They transfer large amounts of nutrients from sea to land, resulting in nutrient-rich soils that support a variety of plant species. Seabirds and their eggs are important traditional food resources for island communities.

The globally threatened Bristle-Thighed Curlew winters on Pacific islands. (Photo: Ray Pierce)

In the Pacific islands, people remain heavily reliant on their unique biodiversity and ecosystems for their livelihoods and wellbeing. Loss of biodiversity has a direct impact on people's lives.

A Traditional Vanuatuan house built with local materials and showing the family taro plantation. (Photo: Marita Manly).

Most Pacific islands remain dependent on local natural resources for food and a source of income.

The threat to island biodiversity

Islands are extinction hotspots

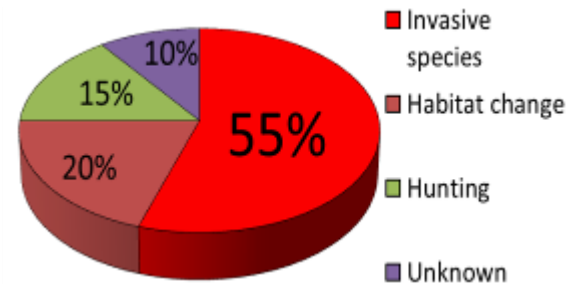
Extinctions on islands are more common than on continents. For example:

- 80-90% of all reptile extinctions have occurred on islands;
- 80-93% of all bird extinctions have occurred on islands;
- 50-81% of all mammal extinctions have occurred on islands.

The Pacific has more threatened bird species per unit of land than anywhere else in the world and is home to nearly 25% of the world's globally threatened bird species.

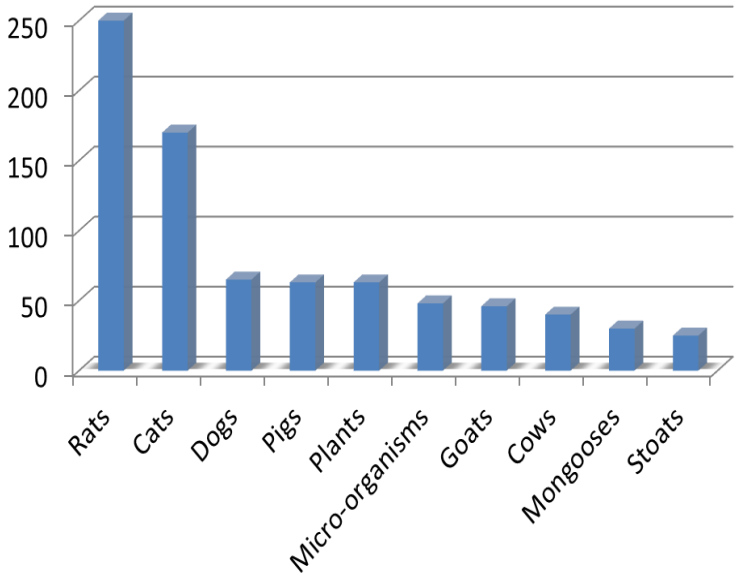
Invasive species are the biggest threat to island biodiversity

Invasive species are **the major cause** of the decline and extinction of native species on islands. By predating on and out-competing native species, invasive species have been responsible for 55% of all recent bird extinctions on islands.



Causes of recent bird extinctions on Islands (Bird Life International)

While there are many different invasive species, the two greatest threats to island biodiversity and to seabirds in particular, are rodents and cats.



Number of globally threatened bird species affected by different types of invasive species. (Adapted from BirdLife's World Bird Database, 2008).

Feral cats on Guadalupe Island, Mexico, have caused the extinction of 6 endemic bird species (Photo: Luciana Luna)

House mice are competing with endemic rodents on at least 12 Mexican islands, are creating a challenging situation for their eradication (Photo: Araceli Samaniego-Herrera)

A rat attacking a NZ fantail nest (Photo: David Mudge)

Islands are particularly vulnerable to invasive mammals, such as rodents and cats, because:

- Native animals and plants have not evolved defences against mammalian predators.

The isolation of islands has meant that native species have not had to compete with invasive species and so have not evolved any defence mechanisms; the native species are defenceless in the face of these new threats. For the invasive species this can mean an easy food supply.

- Invasive mammals have no natural predators on islands.

  Unchecked by the predators and diseases that would keep numbers down in their home range, the growth of an invasive species population can be rapid once introduced onto an island.

Eradication as a tool for restoring island biodiversity

The successful eradication of invasive species from islands has a significant benefit to the native biodiversity. With the removal of the competition and predation from invasive species, recovery of some native species can be rapid and spectacular.

The changes seen on the Phoenix Islands are typical of the results of invasive species eradications.

The numbers of seabirds on McKean Island (Phoenix Islands, Kiribati) have significantly increased since the eradication of the Asian rat in 2008 (Photo: Ray Pierce)

In 2006, a survey of the Phoenix Islands, Republic of Kiribati, concluded that there had been a serious decline in many native seabird species due to the presence of the Asian rat. Following the report, in 2008 Asian rats were eradicated from McKean. The following year in 2009, a post-eradication monitoring survey found clear evidence of large increases in seabird populations and a significant recovery in native vegetation.

Phoenix Island before eradication - 2008 (Photo: Ray Pierce)

Phoenix Island after eradication – 2009 (Photo: Ray Pierce)

Other benefits

The benefits of eradicating invasive species from islands are more than just improvements to biodiversity; their eradication can also have significant economic and health benefits.

- **Economic**

Rodents cause severe losses to livelihoods, food security and economies on islands. Rats eat up to 10% of their body weight each day, equivalent to 9 to 18 kg of matter per animal per year. They significantly reduce production of important food and cash crops such as taro, cassava, coconuts, cocoa and papaya.

They also contaminate people's food stores with urine and faeces.

By increasing crop yields, eradication of invasive species can have a major benefit to the economies of Pacific Islands.

The people of Viwa Island, Fiji, consider Pacific rats to be a major pest as they eat crops and stored foodstuffs. It is reported that up to 50% of crops are lost to rats. This was the incentive for an eradication project in 2006. (Photo: Rob Chappell)

- **Health**

The presence of rodents can have a serious impact on population health. For example, rodents spread the bacteria that cause Leptospirosis, a potentially fatal condition that is characterised by meningitis, liver damage (causing jaundice), and renal failure.

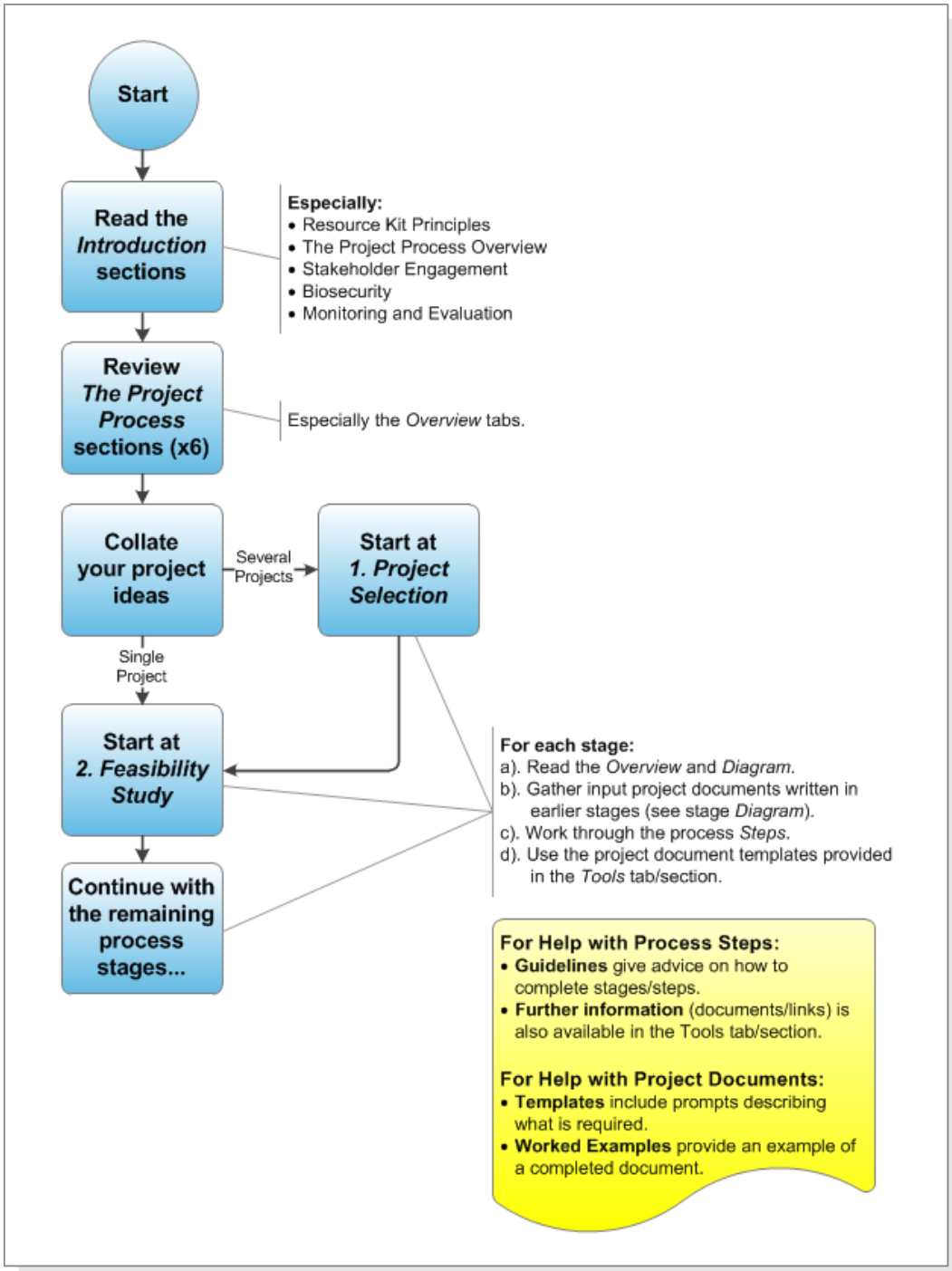
Annual incidence by 100,000 people	**Country**
High (>10)	Fiji, French Polynesia, New Caledonia, Wallis and Futuna
Moderate (1 to 10)	American Samoa, Palau, Marshall Islands, Vanuatu
Low (<1)	
Insufficient information	Papua New Guinea, Western Pacific Islands not mentioned above

Summary of incidence of Leptospirosis in the Pacific region. Adapted from Vitoriano *et al*. (2009).

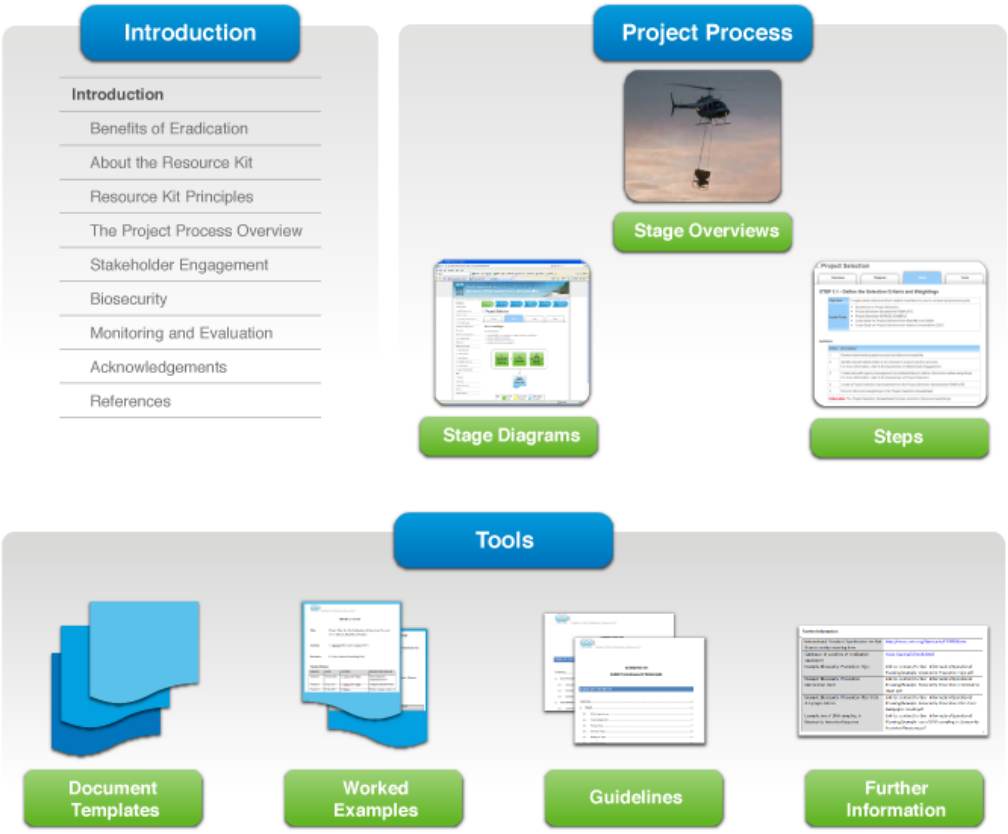
Eradicating rodents from Pacific Islands will remove significant health threats and greatly increase the quality of life for many Pacific islanders.

About the Resource Kit

How to use the Resource Kit


Start
Read the *Introduction* sections
Especially:
• Resource Kit Principles
• The Project Process Overview
• Stakeholder Engagement
• Biosecurity
• Monitoring and Evaluation
Review *The Project Process* sections (x6)
Especially the *Overview* tabs.
Collate your project ideas
Several Projects
Start at *1. Project Selection*
Single Project
Start at *2. Feasibility Study*
Continue with the remaining process stages...
For each stage:
a). Read the *Overview* and *Diagram*.
b). Gather input project documents written in earlier stages (see stage *Diagram*).
c). Work through the process *Steps*.
d). Use the project document templates provided in the *Tools* tab/section.
For Help with Process Steps:
• **Guidelines** give advice on how to complete stages/steps.
• **Further information** (documents/links) is also available in the Tools tab/section.
For Help with Project Documents:
• **Templates** include prompts describing what is required.
• **Worked Examples** provide an example of a completed document.

What is in the Resource Kit?



Introduction

The Introduction provides a number of sections describing the background and context of the Resource Kit. These sections cover the background to the invasive species problem, how the Resource Kit helps solve the problem and some key concepts behind the Resource Kit. There is also a section on how to start using the Resource Kit.

Project Process

The instructions for how to use the Resource Kit are covered in the Project Process pages. For each stage, we provide:

- an overview explaining the benefits of completing the stage
- a diagram of the steps in the stage
- step by step instructions for completing the stage.

Tools

For each stage, the Resource Kit provides supporting tools to help you complete the steps and stage. There is:

- a set of template documents for each of the documents to be written.
- a completed example for each of the template documents (based on a hypothetical eradication project).
- a set of guidelines that contain advice and information on completing the various aspects of an eradication project.
- further information on each stage, including example material from real projects.

There is also a Glossary of key terms and a Further Information section that is not specific to a particular stage but of interest to eradication projects in general. And finally, we provide a page where you can download the Resource Kit in a printable format or request a full version of the kit on DVD.

Note: Some of the Further Information are links to external websites; if running the Resource kit from the DVD you will still need to be connected to the internet to access the external Further Information.

Resource Kit Principles

We have learnt a number of important lessons from the eradication projects that have been attempted in the Pacific. These lessons have significantly influenced the development of the Resource Kit. Project managers and eradication team members should consider these principles as they move through the eradication process and ask how they can apply them to their projects.

Keep your eye on changes that may affect feasibility

As major decisions are made in the planning and preparation for the eradication operation, the project manager must remember to continue to verify that the project remains feasible. Some changes made late in the planning process may mean that significant changes are needed in the approach if the project is to remain feasible. Without ongoing checking of project feasibility you run the danger of attempting an eradication project that has major risks of failure.

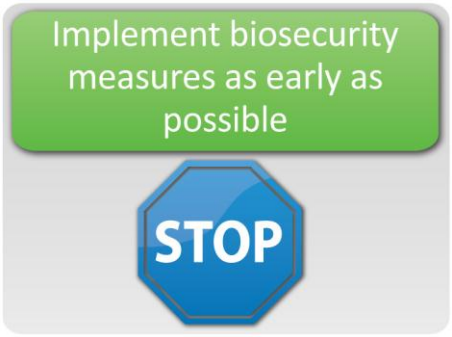
See *Feasibility Study* section for more details.

Engage with Stakeholders from the start

Stakeholder support is key to project success. Involving the right people at the right time in the project will build support and ownership of the project among people and organisations.

See *Stakeholder Engagement* section for more details.

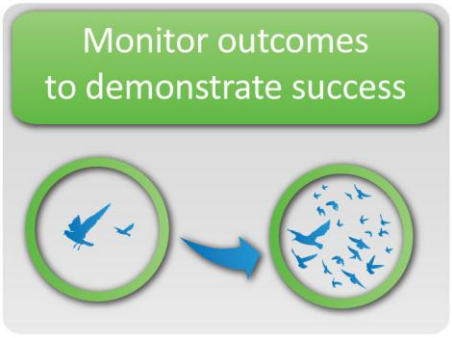
Implement Biosecurity measures as early as possible



Eradication is only the first step in island restoration. If the benefits of eradication are to be long lasting the island must be protected against further invasions.

See *Biosecurity* section for more details.

Monitor outcomes to demonstrate success



Collecting information before and after the eradication will allow you to demonstrate the benefits of the eradication.

See *Monitoring and Evaluation* section for more details.

The implementing agency must take responsibility

The implementing agency must take full ownership and responsibility and show leadership for the project from start to finish. This involves complete commitment to the planning and resources required (including the allocation of enough time to do the work). Experience has shown that where this does not happen problems arise (e.g. team members' time is diverted to other projects,

essential work is either not done or done at the last minute) and the chances of failure increase. The time required from each team member must be formally endorsed by the implementing agency.

Start easy and grow with experience

If this is your first eradication project, consider starting with a small project and slowly increase the size and complexity as you build capacity and confidence. Your first project could be a small unoccupied island, with one invasive species, simple logistics and no major risks. It is better to build your skills and capacity on this type of project, rather than a large occupied island with a number of invasive species and many issues to resolve.

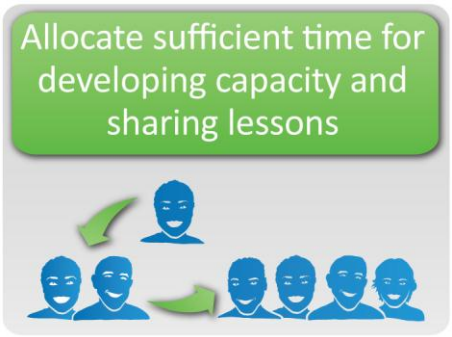
Plan thoroughly

Stage by stage planning of every aspect of the project increases the chances of success because it involves considering all the resources needed for the project, sets out how to get them, when you will need them and who will be responsible for them. It also allows you to identify issues and anticipate problems early on and put in place measures to deal with them. Good planning cannot be rushed or done at the last minute; experience has shown that many eradication projects fail due to insufficient planning and preparation.

Seek independent advice

Eradication projects are all about establishing networks, learning from others and sharing experiences. Even the most experienced people need help with some aspect of every project. Involving experienced people from the start allows you to take advantage of knowledge that has been gained in other projects and reduces the chances of making mistakes later on. Using independent experts to review plans and provide advice throughout the project will help ensure you are making the right decisions and allow you to learn from the experts. Many implementing agencies in the Pacific will not have staff with the complete range of skills and resources required for each project. You must be prepared to obtain missing skills from others.

Allocate sufficient time for developing capacity and sharing lessons



Each project will create new lessons and knowledge about eradications. Build into the project, time to reflect and distribute lessons learnt, both among the team and to the wider invasive species management community. You also need to make sure that the least experienced team members are given the opportunity to use the project as training so that the capacity of your organisation can grow.

Every eradication project builds on knowledge gained from projects before it and much of this knowledge is gained through learning by doing. The most effective way of learning how to do something is to be actively involved in doing it. Actively encourage your team members and stakeholders to be involved. It is a great way to build a team and educate and inform people about the benefits of eradication projects. Involvement helps develop knowledge and skills for future projects.

The Project Process Overview

The Process Stages

Project Documents

Putting your plans in writing allows everyone involved to know what is happening and where they fit in. The eradication process takes you through the necessary planning stages to produce six key documents. The key project documents (templates and worked examples) are provided in the Tools section) are:

1. Feasibility Study Report

Written in the Feasibility Study stage. Describes the findings of the Feasibility Study and is targeted at funders, management and project managers. The report is also used in the Project Design and the Operational Planning stages.

2. Project Plan

Written in the Project Design stage. A project management document, detailing how the project will be managed and governed. The Project Plan is targeted at funders, management and project managers and is used in all later stages to manage the project.

3. Operational Plan

Written in the Operational Planning stage. Describes the details of how the eradication operation will be undertaken. To be read by the eradication operation team and the project manager. The Operational Plan is used in the Implementation stage to prepare and implement the operation.

4. Biosecurity Plan

Written in the Operational Planning stage. Describes the prevention, surveillance and incursion response work. To be used in the Implementation and Sustaining the Project stages by the people responsible for biosecurity, to prepare and conduct the biosecurity work.

5. Monitoring and Evaluation Plan

Written in the Operational Planning stage. Describes how and when each indicator will be measured. To be used in the Implementation and Sustaining the Project stages by the people responsible for monitoring.

6. Project Report

Written in the Sustaining the Project stage. Reports on the results of the project outcome monitoring and how well the project has achieved the objectives.

Funding

As each funding organisation will have a different application process, the Resource Kit has been designed to be independent of a particular funding approach, yet sufficiently flexible to fit any funding application need. Each of the key project documents is designed to be used by an implementing agency in support of a funding application. We would expect the funding agency to also require applicants to complete their own funder-specific funding application documents.

Funders also have different project funding models, i.e. funding of different stages together or separately. The six stage approach of the Resource Kit allows it to be applied to any funding model.

Typical funding models used include:

- Funding an entire project from idea to completion in one go (Project Selection to Sustaining the Project).

- Funding the Project Selection and Feasibility Study stages, followed by funding the Project Design to Sustaining the Project stages.

- Funding the Project Selection to the Project Design stages, followed by funding the Operational Planning to Sustaining the Project stages.

Stakeholder Engagement

What is a stakeholder?

A stakeholder is an interested party to the project. They are people or organisations that will be impacted by the project, contribute in some way to the project or just have an interest in the project. There are a wide number of stakeholders and each will have their own needs and will need to be engaged in a way relevant to them at each stage.

Examples of stakeholders:

- Communities living on the island or using the island for food and resources
- Island visitors, e.g. tourists, fisherman, research scientists
- Island land owners
- Implementing agencies
- Technical assistance providers
- Funders
- Government departments
- Local government/administration departments

Community groups are key stakeholders in eradication projects. Their close connection to, and dependency on the island, mean that they may be highly impacted by the effects of invasive species and may be major benefactors of the eradication project. Being so closely associated with the location, communities will also be a major source of information on the project. Their support and involvement is vital to most eradication projects.

Types of stakeholder engagement

Stakeholder engagement is a common thread through every stage of the process. As project manager you need to always be asking yourself:

- Which stakeholders should I be talking to about this stage?
- What is the best way to engage with the stakeholder?
- How can they contribute to the success of the eradication?

Interacting with stakeholders can be broken down into three types of engagement:

1. Consultation

A two-way process where you include the stakeholders in the decision making and planning process. Stakeholders will provide information, opinions and ideas that will directly affect the direction of the project.

2. Informing

Informing stakeholders of decisions, progress and status of the project. This is more of a one-way communication; you are keeping stakeholders informed of project status and progress.

3. Participation

Direct contribution and involvement in the project. For example:

- Members of the local community performing as part of the project team:
  In many eradication projects in the Pacific the local community play an active part in the project including the eradication operation, the monitoring, the surveillance and the incursion response. Community participation is the best means of ensuring local ownership and long term sustainability of the outcomes.
- Visitors to the island conducting biosecurity prevention actions:
  People visiting islands are potentially **the major pathway** for invasive species invasions. If the eradication site is to be kept free of invasive species every visitor needs to be involved to ensure they are not carrying invasive species to the island. This requires a significant amount of public awareness work as part of the Biosecurity Plan, to train the public on what they need to do when visiting the island.
- Funders contributing finances and resources.
- Government departments granting consents.

Why is community engagement so important?

While all stakeholders are important in projects, in Pacific eradication projects, communities play a very central and unique role. A successful project is a collaborative affair with widespread support and involvement from the local community.

Community involvement is important:

- **To align project objectives with community priorities:** It is the community that is most directly affected by changes to the island environment. With the community's close connection to the island they will be major benefactors of the project. Likewise, the local community will also feel any adverse side-effects of the project. The project team needs to work closely and collaboratively with the community throughout the eradication project. It is never too early to be engaging the community on an eradication project.

- **For Biosecurity Plan – Prevention:** Strong community participation and support is essential in implementing an effective Biosecurity Plan to prevent future invasive species invasions. The community will make up a large (if not majority) proportion of travellers to the island. As such they are a major invasive pathway to the island. The community will need to embrace the Biosecurity Plan and adhere to the prevention techniques when travelling to the island, if the biosecurity is to be successful.

- **Source of local information:** The community can provide essential information about the island that will help the team plan the eradication project. Much of this information will be collected during the Feasibility Study stage site visit.

- **For participation:** Local communities may be able to actively participate in the project and provide manpower and resources to the project team. As well as providing manpower, this creates opportunities for communities to up-skill in eradication techniques.

Biosecurity

What is Biosecurity?

The purpose of biosecurity is to:

- Keep the island free of the target species you have eradicated
- Keep the island free of new invasive species
- Prevent the export of invasive species from the island to other islands.

Biosecurity activities involve: prevention, surveillance and management of incursions of invasive species.

Removal of one invasive species can make the island more vulnerable to other invasive species e.g. the eradication of Norway rats (*Rattus norvegicus*) from Raoul Island, New Zealand may have significantly increased the chances of mouse (*Mus muscles*) survival and colonisation, should an incursion occur. So the Biosecurity Plan must consider all possible invasive species; not just the target species.

The routes that invasive species take to arrive at an island are called pathways. Most pathways are due to people and goods travelling to the island by boats. Therefore much of the work in the Biosecurity Plan involves working with visitors to the island to prevent this happening. However, rats can swim considerable distances and can invade islands without the help of people – this biosecurity threat also needs to be managed.

Some species of rats have been known to swim up to 2 km to reach an island (Photo from: Gen-Yu Sasaki)

Why is Biosecurity important?

Prevention is better than cure: The best way of protecting island environments from the impacts of invasive species is to prevent the invasive species getting to the island in the first place. This will avoid the range of impacts due to invasive species and help retain the island in its natural state. If we prevent invasions then the eradication project (the cure) will not be required - saving significant time and money.

Give the island environment time to recover: Most eradication projects are completed as part of a program of restoring the native environment of an island; the eradication is only the first part of the restoration. Keeping the island invasive-free after the eradication will give the island's environment time to recover to its natural state.

Avoid the spread of other invasives: For invasive species already on the island (but not targeted for eradication) the Biosecurity Plan needs to consider plans for preventing further introductions and how the project team is going to avoid contributing to the spread of the species throughout the island. The last thing the project team wants is to be responsible for is the spread of an invasive species at the eradication site.

Ensure the project is a success: If a suitable biosecurity plan is not implemented as part of the eradication project the likelihood of the project being a long term success is very low. The

eradication operation itself may well succeed in removing all of the present individuals, but if a later invasion occurs all the good work of the operation will be rapidly undone. The fact that an island already has invasive species present is an obvious indication that there exists viable invasion pathways, and therefore the island is under continual threat of further invasions by existing and new invasive species. Failure to adequately manage this ongoing threat will result in the failure of any eradication.

Avoid transporting invasives between islands: The invasive species present will vary from island to island. Often in a group of islands, only some of the islands will have a particular species of invasive species and others will have remained invasive species-free. Visitors to an island that has invasive species must always ensure that when leaving the island they do not help to export the species off the island and act as a pathway for the invasive species to invade other islands. In eradication projects that involve several islands it is particularly important that the project team takes every precaution to avoid transporting any invasive species between islands. Beware – it is very easy for the project team to become the pathway.

The three lines of Biosecurity defence

Prevention

Preventing invasive species from getting to an island and establishing a breeding population is the most effective measure. Prevention involves identifying the pathways which an invasive species may use to get to an island, assessing the risk of these and applying procedures to minimise each risk. This aspect should be done at all times, particularly before any travel (including the project teams) to the island. All existing and potential invasive species should be considered, i.e. invasive species to be eradicated as part of the project and any that are not currently on the island but could pose a threat. Prevention is also sometimes referred to as quarantine. The trick is to put in as many obstacles as possible along different parts of the pathway to reduce the ease of movement of the invasive species.

Rats are agile climbers and use mooring lines to board boats (Photo: Global Invasives Species Database)

Surveillance

Surveillance is monitoring to detect whether an incursion has occurred. An incursion is when an invasive species has evaded the prevention measures and arrived on the island. This is a long-term activity, with on-going or regular monitoring in place on the island.

Incursion Response

A project management decision-making plan will be in place that assists with the planning of how to confirm that an incursion has occurred, what further information is required and what is the best way to handle the incursion.

If the surveillance suggests that an incursion has occurred, the project team need to respond to the threat. A range of information will be required to decide how to react, for example:

- What is the invasive species?
- What size is the incursion? (e.g. a single animal/plant, small group of animals/plants, large number of animals/plants)
- What is the breeding status etc of the animals/plants? (e.g. lactating female; immature juvenile)
- How long has the species been on the island? (i.e. recent incursion or old incursion that has gone undetected)

Community involvement in Biosecurity

As most pathways involve people travelling to the island much of the prevention work will be undertaken, not by the project team but by the wider public and especially local communities and island visitors. Get the input of local communities and island users to help work out biosecurity measures that will be effective in the local situation. Identify what they value on invasive free islands (e.g. larger harvest from crops as rodents are not eating them) so they have an interest in keeping the island invasive-free. Visitors need to be taught which invasive species threaten the island and what they need to do to prevent re-invasion. This will require the project team to conduct a public awareness exercise and consult widely with stakeholders to inform the public of the role they can play and to motivate them to take biosecurity seriously.

Biosecurity in the Project Process

This table details the biosecurity actions that occur throughout the project process.

Project Process Stage	Project Process Step	Project Document Section	Biosecurity Action
Stage 2. Feasibility Study	STEP 2.5 Start the Can it be done? Section	5.2 Feasibility Study Report: Sustainable section	Ask is the operation sustainable?
	STEP 2.6 Complete the Site Visit Biosecurity Assessment		Plan prevention for site visit
	STEP 2.7 Visit the Site and Update the Can It Be Done? Section	5.2 Feasibility Study Report: Sustainable section Appendix: site visit	Implement site visit prevention. Ask is the operation sustainable?
Stage 3. Project Design	STEP 3.9 Estimate the Project Costs	Project Plan: Project Costs	Estimate Biosecurity costs
Stage 4. Operational Planning	STEP 4.1 Identify Stakeholders	Operational Plan	Decide and plan the consultation required for writing the Biosecurity Plan
	STEP 4.9 Plan the biosecurity	Biosecurity Plan	Plan the work required for prevention, surveillance and response
Stage 5. Implementation	STEP 5.2 Implement Biosecurity Prevention		Ensure prevention measures are implemented.
	STEP 5.3 Train the Team		Train the team
	STEP 5.5 Source the Equipment		Get the equipment
Stage 6. Sustaining the Project	STEP 6.2 Continue Biosecurity Prevention		Continue to ensure prevention measures are implemented
	STEP 6.3 Prepare for Biosecurity Incursion Response		Prepare the incursion response
	STEP 6.4 Commence Biosecurity Surveillance		On island surveillance
	STEP 6.5 Respond to Possible incursions		Respond to incursion
	STEP 6.7 Complete a Project Report		Reporting any incursions

Monitoring and Evaluation

What is monitoring and evaluation?

Monitoring is the repeated measurement of an indicator to assess how the indicator is changing through time.

Evaluation is using the information measured in the monitoring to answer some specific questions of the project (evaluating the information).

In an eradication project there are three types of monitoring and evaluation:

Project Outcomes

As part of the Project Plan you will define the outcomes of the project – the positive benefits to the island from the eradication of the target species. To evaluate and demonstrate the success of the project you will need to measure indicators that tell you whether you are achieving your outcomes. To give a complete picture you may need to measure more than one indicator for each outcome.

When selecting the indicator you need to ask yourself: 'What can I repeatedly measure (before and after the eradication operation) that will allow me to show that the project is achieving its objectives?'

A baseline measurement is the pre-eradication monitoring to tell you what things are like before the eradication starts. Repeating the same measurements after the eradication enables a direct comparison between the before and after conditions on the island. This provides a clear measure of the effects of the eradication operation.

As monitoring involves comparing repeated measurements it is important that the monitoring plan is well thought out and the same measurements are taken each time you monitor, so that you are comparing apples with apples.

The indicators for the outcomes are defined in the Project Plan document, and how they are measured is detailed in the Monitoring and Evaluation Plan document.

Operational

Monitoring will be used in the Operational Planning and Implementation stages as part of the preparation and undertaking of the actual eradication operation.

In the Operational Planning stage, monitoring may need to be used in trials to help resolve unanswered questions arising from the Feasibility Study or provide further information needed in the planning of the operation. Common uses of monitoring include:

- Assessing bait toxicity on target species
- Non-toxic bait trials to see how much bait is likely to be taken by non-target species such as crabs
- Assessing trap, bait station and bait effectiveness

During the eradication operation there are a number of details that the project manager will need to monitor closely to ensure the smooth running of the operation. These may include:

- Amount of bait deployed
- Amount of bait remaining to be deployed
- Bait breakdown
- Bait consumption by invasive species
- Number of traps deployed

Project Management

The project manager is responsible for the progress of the project. To review progress of the project, the project manager will use a set of project management indicators. These indicators are chosen from different aspects of the project to give a view of the schedule and budget of the project.

Budget and money spent is one of the key project management indicators and will be monitored closely on all projects. Other project management monitoring may include, for example: monitoring the risks of the project, status of key tasks/activities and public awareness of the project.

The results of the project monitoring will also be used to inform your manager and other stakeholders, for example, funders of project status. This will be part of the project reporting. Many funders will make project reporting a condition when providing funding.

In the Eradication Process, the project management indicators are defined during the Project Design stage and recorded in the Project Governance section of the Project Plan.

Why is monitoring and evaluation important?

Evaluate and demonstrate the success of the project: Monitoring allows you to make a transparent and objective evaluation of whether the project has been a success or not. The implementation of a Monitoring and Evaluation Plan will provide the project manager with the information required to evaluate and demonstrate to stakeholders the success of the project. Communication of project outcomes and success is a fundamental requirement of all projects.

If you don't do it, you won't know if you have succeeded: Without a well thought out Monitoring and Evaluation Plan project managers will not be able to tell whether the project has achieved its objectives. This significantly undermines the value of the project – what value is a project if you cannot objectively assess whether it was successful? Stakeholders (management and funders, in

particular) not receiving a clear evaluation of the success of the project will lose confidence in the project. This will result in loss of project credibility, stakeholder support and possibly withdrawal of involvement in the project. Inadequate monitoring and evaluation will result in a perception of project failure – and, as perception becomes reality, a project that cannot clearly demonstrate success will always be in danger of being seen as a failure.

Helps manage the project: Monitoring project indicators provides important information to the project manager on how well the project is meeting its objectives. The information gained from evaluating the monitoring will tell the project manager where the project is going to plan and where it is not, and if action is required.

If you don't measure it, you can't manage it: Not collecting the correct monitoring data will mean the project manager may be 'flying blind' when managing the project. Without the relevant monitoring data the project manager will be making uninformed decisions raising the threat of making wrong decisions and endangering the project.

Surveillance

Surveillance is a special type of monitoring and is used in the Biosecurity Plan. Surveillance is the monitoring for evidence of the presence of an invasive species. When conducting surveillance as part of the Biosecurity Plan you want to know:

- What is the invasive species? May be more than one species. Also classify as animal, plant or disease.
- What size is the incursion? (e.g. a single animal/plant, small group of animals/plants, large number of animals/plants)
- What is breeding status etc of the animals/plants? (e.g. lactating female; immature juvenile)
- How long has the species been on the island? (i.e. recent incursion or old incursion that has gone undetected).

Monitoring in the Project Process

This table details the monitoring actions that occur throughout the project process.

Project Process Stage	Project Process Step	Project Document Section	Monitoring Action
Stage 2. Feasibility Study	Step 2.4 Define Goal, Objectives and Outcomes	Feasibility Study Report: Goals, Objectives and Outcomes section	Define the project outcomes
	Step 2.8 Assess the Feasibility of the Project	Feasibility Study Report: Assess the Feasibility	If environmental

		section	effects or non-target risks found that result in adding an objective & outcomes
Stage 3. Project Design	Step 3.3 Define Goal, Objectives and Outcomes	Project Plan: Goals, Objectives and Outcomes section	Include outcomes in Project Plan
	Step 3.6 Define the Project Governance	Project Plan: Project Governance section	Define the reporting of the monitoring results
	Step 3.7 Define Project Outcome Monitoring	Project Plan: Monitoring the Success of the Project	Define the indicators
	STEP 3.9 Estimate the Project Costs	Project Plan: Project Costs	Estimate Monitoring costs
Stage 4. Operational Planning	STEP 4.1 Identify stakeholders		Decide and plan the consultation required for writing the Monitoring and Evaluation Plan
	STEP 4.8 Plan the Monitoring	Monitoring and Evaluation Plan	Define details of measurements of indicators.
Stage 5. Implementation	STEP 5.3 Train the Team		Train the team
	STEP 5.5 Source the Equipment		Get the equipment
	STEP 5.8 Do pre-operational monitoring		Conduct baseline monitoring
Stage 6. Sustaining the Project	STEP 6.6 Conduct Post-Operation Monitoring		Conduct post-operational monitoring

	STEP 6.7 Complete a Project Report	Final Project Report	Report on outcome monitoring evaluation

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The high level design and approach for the Resource Kit was produced by the Scoping Team, consisting of: Elenoa Seniloli (BirdLife Fiji Programme), Julien Baudat-Franceschi (Société Calédonienne d'Ornithologie), Ratita Bebe (Wildlife Conservation Unit and Quarantine, Kiritimati, Kiribati), Nunia Thomas (NatureFiji-MareqetiViti), Natasha Doherty (Ministry of Natural Resources and Environment, Samoa), Mark Bonin (Pacific Invasives Learning Network), Michele Frank, Shelley Chignell, Keith Broome (DOC), Pam Cromarty (DOC), Alex Wegmann (Island Conservation), Gideon Climo, Souad Boudjelas (PII), Jo Ritchie (PII), Batiri Hughes (PII) and Bill Nagle (PII).

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