# PII Resource Kit for Invasive Plant Management

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## Welcome to the PII Resource Kit for Invasive Plant Management

This kit provides project managers and staff with a practical guide to plan and implement invasive plant management projects

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# Introduction

## About PII

The Pacific Invasives Initiative (PII) is the 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 PII and its work can be found at: www.pacificinvasivesinitiative.org

## Purpose of this Resource Kit

Invasive plant management projects are usually complex and long-term. Effective programme prioritisation, design and implementation are essential to assist managers to monitor and evaluate the effectiveness, efficiency and accountability of an invasive plant management project.

The PII Resource Kit for Invasive Plant Management (Invasive Plant Resource Kit) provides a practical guide to assist invasive plant teams (i.e. decision makers, project managers, officers and field crews) to apply informed decision making in the prioritisation, design, development and implementation of an effective invasive plant management programme, thereby, increasing their chances of success.

The need for this 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.

The Invasive Plant Resource Kit provides access to a range of information sources including current knowledge and best practice. The focus is on Pacific Island Countries and Territories (PICTs). However, this Resource Kit will also be useful for many other Regions working on invasive plant management. PII has also developed an Invasive Plant Management Training Course in association with this Resource Kit. Contact PII if you would like more information on the Training Course.

## Scope of this Resource Kit

The PII Resource Kit for Invasive Plant Management focuses on the management of invasive plants from sites (i.e. islands and/or mainland areas). Strategies for invasive plant management are: prevention, eradication, control, or do nothing.

This Resource Kit works through the six stages of the PII Project Process in a series of closely-linked steps:

1. **Project Selection:** a process to select the highest priority project(s) so that resources are used to the best advantage.
2. **Feasibility Study:** gives an indication of whether the project is achievable, or not, by investigating seven key criteria.
3. **Project Design:** describes the governance and management (responsibilities, timing, logistics) of the project.
4. **Operational planning:** specifies how the operation will be implemented.
5. **Implementation:** this is where the operation is done!
6. **Sustaining the Project:** the on-going work required after the operation has been completed.

## How this Resource Kit was developed

The PII Resource Kit for Invasive Plant Management was designed by combining PII's experience working with Pacific agencies with existing best practice for invasive plant management. PII actively involved invasive plant specialists and Pacific practitioners throughout the development of the Resource Kit to ensure the content is both accurate and relevant.

# About Invasive Plant Management

## 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.

The interaction between native plant and animal components is essential to the maintenance of a healthy ecosystem (Photo: Chris Thompson)

Loss of biodiversity on islands has a direct impact on people's lives by reducing access to food, clean water, shelter and a source of income. Many Pacific people remain heavily reliant on their unique biodiversity and ecosystems for their livelihoods and wellbeing. As well as having negative effects on island biodiversity, invasive plants can also reduce yields in cash crops or subsistence crops and there is likely to be additional hardship through the extra labour and costs required to manage the invasive species.

Some island communities and agencies are now taking a "ridge-to-reef" approach when managing the natural environment: watershed or catchment-wide management ensures a healthy and intact native forest; streams with stable banks; minimal silt or other contaminants entering the water; healthy wetlands assisting in trapping silt and filtering contaminants; and a coastline well-vegetated in species which prevent coastal erosion. Healthy native vegetation and stable ecosystems are essential to maintain the food-web inter-dependency among endemic and native birds, insects, invertebrates and other fauna.

Weaving mats from natural fibres. (Photo: BirdLife International)

## The threats to island biodiversity

Threats to island biodiversity can be caused by factors such as climate change and sea level rise, clearing of native vegetation for forestry, cropping or grazing and the harmful effects of invasive animal or plant species.

"*Pacific islands are particularly vulnerable to invasive species, because of their isolation and relatively recent human occupation. Pacific island species have not evolved to cope with the impacts of predators, herbivores, insect pests, highly competitive weeds, and diseases brought in from continental areas. Invasive species are responsible for the extinction of more island native species than any other cause. This is exacerbated by the fact that small island states often have limited human, material and financial resources available to tackle such threats.*" (from Guidelines for Invasive Species Management in the Pacific. SPREP/SPC, 2009)

## Invasive plants

An invasive plant is any plant which has the ability to thrive and spread aggressively outside its native range. They are sometimes referred to as exotic invasive plants or alien invaders. The plant species may be a terrestrial (land growing) plant, an aquatic plant (infesting any freshwater area including streams and wetlands) or a marine plant species (for example an exotic seaweed or algae infesting a coral reef).

Invasive plants can be of any form; a forest canopy tree species, a vine, a shrub, a groundcover herb or a grass. Some forms of harmful plant pathogens such as fungi and bacteria, can hitch-hike and also cause considerable damage to native and valued plant species.

### Pathways of introduction

Plant species are usually introduced, or spread, to new locations via intentional, accidental or natural means.

*Intentional* means can include:

- Ornamental plants
- Crop or forestry plants
- Aquarium plants

*Accidental* means can include:

- Contaminants of machinery
- Seed clinging to clothing
- Plants used in traditional dress or personal beautification

*Natural* means can include:

- Wind-borne seed
- Bird, or animal-borne seed
- Water-borne seed or viable plant fragments
- Plant fragments and seed spread with debris from natural events, e.g. tsunami, cyclone.

Most new plant introductions have occurred through *intentional* or *accidental* means and have greatly increased with increasing trade and as people have become more mobile in their global, regional and local travel. Plant pathogens can be moved with any plant or soil material, or from site to site by, for example, movement of surface water.

These hat wearers at a dance competition may have viable plant parts in their decorations. (Photo: Bill Nagle)

The use of plant parts as everyday personal beautification could lead to the spread of invasive species. (Photo: Natasha Doherty)

## Impacts of invasive plants

Some plant species spread rapidly in a new location and may form dense single-species stands, outcompeting native plants and interfering with natural regeneration. Invasive plants can invade natural forest environments (e.g. kerosene tree *Falcataria moluccana*), others reduce agricultural yield (e.g. nutsedge *Cyperus rotundus*), or invade waterways and exacerbate flooding (e.g. water hyacinth *Eichhornia crassipes*). This may be due to an often complex range of factors, including:

- The invader is free of the natural enemies, such as insects or pathogens, which limit its growth in its native range
- Native vegetation may be unable to compete with the fast growth rate of the invader
- The extent to which native vegetation has been previously disturbed at the site through land clearance, cyclones, fire, landslides, flood damage, animal browsing or pig rooting
- Reduction in seed or propagule production of native species through the predation activity of rodents, ants, or other introduced organisms
- Some invading plant species have chemical effects on the growth, survival and reproduction of surrounding vegetation (allelopathy)
- Reduced abundance of native plant pollinators and dispersers
- The arrival of a pollinator or disperser which increases the reproductive ability of the invader
- Greater seed or propagule production rate of the invader
- Soil health and moisture levels favour the invader

Invasive plants may be poisonous or harmful to livestock or humans. They may also be spiny and prevent access to agro-forestry, plantation, or other areas. Some invasive plant species grow quickly but have a weak root system and are prone to toppling or uprooting in strong winds. There can be an increase in soil and silt running off these areas resulting in degraded water quality, flooding and silt deposits smothering reef or other marine areas.

Other invasive plant species are able to alter soil chemistry by, for example, fixing nitrogen within the plant's root system and creating soil conditions that encourage the growth of some species over others. Some invasive grasses are especially well-adapted to fuel fires and then quickly re-establish following a fire. Although they may form a dense mat of grassy vegetation, this is not as stable as some tree species on steep land and may exacerbate erosion.

Invasive plants can quickly dominate areas cleared for agriculture or damaged by natural events such as cyclones. (Photo: Bill Nagle)

## Restoring Island Biodiversity

*Without plants, there would be no food, no animals of any sort, no life on earth at all …they are constantly on the move: developing, fighting, avoiding or exploiting predators or neighbours, struggling to find food, to increase their territories, to reproduce themselves, to find and hold a place in the sun …* (David Attenborough - The Secret Lives of Plants).

Invasive plant management can be action taken to eradicate or control recent arrivals or small populations of serious plant threats, or as a component of biodiversity restoration projects. Prioritisation of valued sites and target invasive plants is necessary to ensure effort is put in where it will be most useful.

Restoration projects are undertaken at suitable sites and need to be thoroughly planned. A good understanding of all factors that influence the plant and animal population dynamics of the site is required; there may be little point in managing any invasive plant species if the site or infested area can be reinvaded by another invasive species. As a restoration project can be a medium- to long-term undertaking requiring on-going resourcing, stakeholder and community support is essential.

Matters to take into account when considering invasive plant management projects include:

- Whether a replanting programme using suitable native plant species is feasible
- Whether seeds or propagules of native plants will naturally reach the site through wind or bird dispersal and survive to germinate without being consumed by invasive rodents or destroyed by invasive ants
- Whether the target invasive plant species has “nursery plant” characteristics which allow native species to establish within the infested area and eventually dominate

- The size, viability and longevity of the invasive plant seed bank in the soil
- The proximity of other invasive plant species and their likely establishment at the site from, for example, wind-borne seed, or fragments carried by floods

High school students in a nursery shade-house learn about native plants used in restoration projects. (Photo: Natasha Doherty)

## Other Benefits of Invasive Plant Management

The benefits of managing invasive species on islands are more than just conservation of biodiversity; their management can also have significant economic and health benefits. The greatest economic benefit occurs when an invasive plant species is prevented from arriving, or detected and successfully eradicated from an island before it establishes. The plant must be detected at the earliest opportunity and destroyed before producing seeds or propagules.

- **Economic**

Many areas with vegetation of high biodiversity value are used for tourism ventures, the economic mainstay of many Pacific countries. These include marine areas where invasive seaweeds or other organisms could threaten the unspoilt image of the location. Management of invasive plants at these areas can protect these income streams.

Invasive plants can also reduce yields in cash crops, subsistence crops or pastoral areas and there is likely to be additional hardship to people through the extra labour and costs required to manage the invasive species. Effective invasive plant management can protect the economic well-being of people.

- **Health**

  Medicinal (or cultural or other valued plants) can be protected from losses due to invasive plants (e.g. smothering) by the implementation of an effective management programme.


The degraded forest around popular tourist walking and bird watching tracks is being replanted with native species. (Photo: Bill Nagle)

The mountainous landscapes of Tahiti are a magnet for tourists in French Polynesia. (Photo: John Mather)

## Adaptive Management

Invasive species management projects are usually complex and long-term. Effective programme prioritisation, design, and implementation are essential to assist managers to monitor and evaluate the effectiveness, efficiency and accountability of a project. However, accurate information and best practice methodology is often lacking.

Decisions on the management approach (site-led or species-led), suitable treatment methods and the timing of treatments are often complicated. Some of the matters to consider when managing any invasive plant include:

- The timing of treatment (wet / dry season effects on plant growth and access to the site)
- Suitable treatment methods (must be the least harmful to the environment)
- Follow-up treatment method
- Residual or non-target effects of any herbicide
- A field visit from an expert advisor may be required.

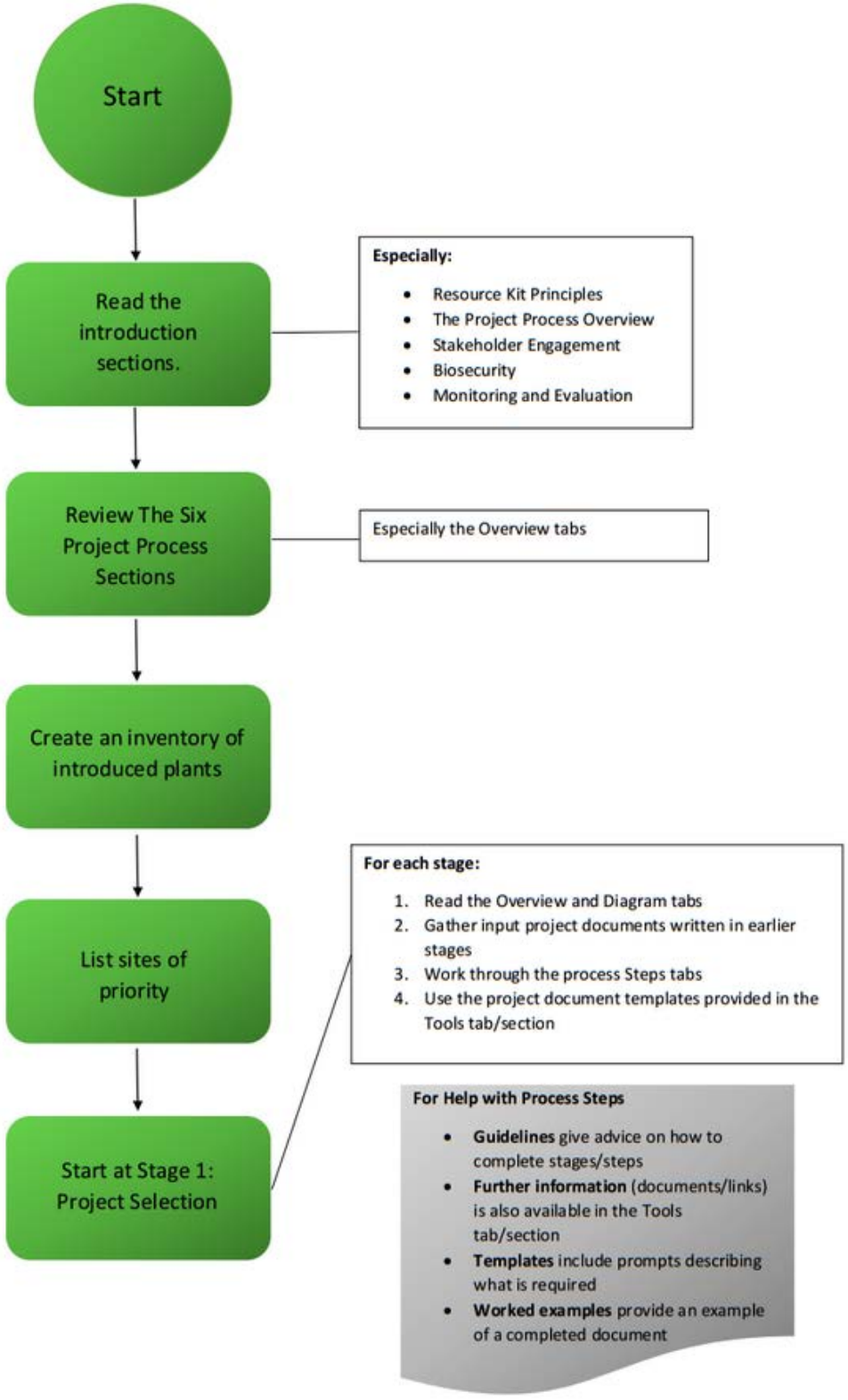
Managers of invasive plant projects have the option of using an adaptive management approach. Adaptive management is simply "learning by doing". It has also been defined as "integrating a scientific approach to management and improving it repeatedly through regular evaluation of outcomes".

Adaptive management is especially useful when there is substantial uncertainty about aspects of the project, for example, the effectiveness of treatment methods or the success of natural regeneration following invasive plant management. Adaptive management allows project team members to work collaboratively and contribute to the decision-making process; planning, implementing, monitoring and evaluating each stage of the project. It is a process of carrying out management programme actions, undertaking regular observation and evaluation, learning from the results of the action, and adapting or modifying further actions to achieve the best result for the project, the environment and the community.

Collecting information prior to applying treatments to African tulip tree (AFT – *Spathodea campanulata*) in Fiji. (Photo: Bill Nagle)

Applying a targeted herbicide treatment to kerosene tree (FAM – *Falcataria moluccana*) with precision equipment. (Photo: Ministry of Natural Resource and Environment, Government of Samoa)

# About the Resource Kit



## Resource Kit Principles

We have learnt a number of important lessons from invasive plant management projects that have been attempted in the Pacific. These lessons have significantly influenced the development of this Resource Kit. Invasive plant teams (e.g. decision makers, project managers, officers and field crews) should consider these principles as they move through the process and ask how they can apply them to their projects.


**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 amongst people and organisations that have an interest in the project.
See Stakeholder Engagement section for more information

**Seek independent advice**
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 right 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 go and find any missing skills from others.

**Plan Thoroughly**
Stage-by-stage planning of every aspect of the project increases the chances of success because it involves considering all of the resources that you need for a project and sets out how you will 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 is not something that can be rushed or done at the last minute. Experience has shown that many projects that fail have done so due to insufficient planning and preparation.

**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 and enough money to finish the project).

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.

**Keep your eye on changes that may affect feasibility**

As major decisions are made in the planning and preparation for a project, 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 a project that has major risks of failure.

See Feasibility Study section for more details

**Implement Biosecurity measures as early as possible**

Operations are only the first step. If the benefits of invasive species management are to be long lasting then you must protect against further invasions. Biosecurity must be part of both eradication and control operations

See Biosecurity section for more details

**Monitor outcomes to demonstrate success**

Collecting information before and after operations will allow you to demonstrate the benefits of your project.

See Monitoring section for more details

**Start easy and grow with experience**

If this is your first 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 on a small site, with one invasive species, simple logistics and no major risks. It will provide a better basis to build your skills and capacity to do this work as opposed to your first project being a large, remote site with a number of invasive species and many issues to resolve.

**Allocate sufficient time for developing capacity and sharing lessons**

Each project will create new lessons and knowledge. Build into the project time to reflect and distribute lessons learned, both amongst 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 organization can grow.

Every project builds on knowledge gained from previous projects 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's a great way to build a team and educate and inform people about the benefits of projects. Involvement helps develop the knowledge and skills for future projects.

# The PII Project Process Overview

## Stages of the PII Project Process


## Project Documents

Putting your plans in writing allows everyone involved to know what is happening and where they fit in. The PII Project Process takes you through the necessary planning stages to produce key project documents. The Tools section of the PII Resource Kit for Invasive Plant Management provides guidelines, templates, worked examples and references to help you prepare:

**1. List of Priority Projects**

Created in the Project Selection stage. Provides a list of priority invasive plants and sites for a country or agency for an Invasive Plant Management Strategy and is targeted at senior management and project managers. This list could be included in National Biodiversity Strategy Action Plans (NBSAPs) and National Invasive Species Action Plans (NISAPs).

**2. Feasibility Study Report**

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

**3. Project Plan**

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

**4. Operational Plan**

Written in the Operational Planning stage. Describes the details of the method(s) and how the treatment(s) will be undertaken. The Operational Plan is to be used by the operation team and the project manager in the Implementation stage to prepare and implement the operation(s).

The Operational Plan also includes the Monitoring Plan which describes how and when each indicator will be measured. To be used in the Implementation and Sustaining the Project stages by the team responsible for monitoring.

**5. 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.

**6. Operational Review Report**

Written in the Implementation stage. The Operational Review is an informal document that records the experience of the team in conducting the operation(s). It is a place for recording how the operation(s) went, any lessons that the team learned and suggestions for next time.

It is used by the Implementing Agency to help build expertise, skills and capacity in its team. It should be done at the end of each treatment application, or an operation, or at least once a year.

The Operational Review is not a document meant for wide circulation outside of the implementing agency and so can be less structured and formal than other project documents.

## Funding

As each funding organisation will have a different application process, the PII Project Process and this Resource Kit have 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 its own funder-specific application documents.

It is important to remember that very few invasive plant management projects will be eradication projects that can be completed in a short time. New incursions and small populations may be able to be planned as eradications, but most projects will be long-term control ones.

This will require a long-term funding commitment after the initial treatment and will probably mean that governments will have to commit funds to the project. This area of project funding needs to be fully explored during the Project Selection and Feasibility Study Stages. Does it make sense to start a project that will not receive sufficient long-term funding?

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

Typical funding models 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 any person, group or organization who contributes to, or is affected positively or negatively, by the project. There may be 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:

- Land owners.
- Communities living on the project site, neighbouring the site, or using the site for food and resources.
- Visitors to the project site; e.g. tourists, researchers, fishermen, hunters.
- Implementing agencies.
- Technical assistance providers.
- Funders.
- Government departments.
- Local government/administration departments.

Community groups are key stakeholders in any invasive species management project. Their close connection to, and dependency on the land, mean that they may be strongly affected by the effects of invasive species and may be major beneficiaries of the management 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 the success of the project.

## Types of stakeholder engagement

There are many different ways you will interact with stakeholders at various stages of the project. Three ways you can involve stakeholders are:

1. **Informing**

   You will inform stakeholders about the project. You will tell them useful bits of information. This is **one-way** communication where people outside of the project team are learning details of the project. Examples include:

   - Reporting to funders on the progress of the project.
   - Explaining to residents of the site the operational plan, how they will be affected and what they need to do.
   - Making completed project documents (e.g. Feasibility Study Report, Project Plan) available for public reading.
   - TV/Radio announcements
   - Newspaper articles

2. **Consulting**

   You will consult with stakeholders. This is a **two-way** discussion where you will give the stakeholders the opportunity to contribute ideas, suggestions and opinions in the

planning and decision-making parts of the project. Introducing ideas early and giving people time to consider proposals is important. If you hurry the consultation you may arouse suspicion and once this happens the community may form a negative view that becomes hard for them to change. Much of the consultation will be with the landowners/community as they are the most affected group.

**3. Participating**

Some stakeholders will participate in the project work. Community groups, visitors and other stakeholders can all make a direct contribution to the project effort. For example, local residents often make up part of the operation team and all visitors need to undertake Biosecurity actions when visiting the project site.

Men of the community contribute local Knowledge to the planning of a project.
(Photo: Samani Tupufia)

A formal meeting attended by men, women and youth community members.
(Photo: Natasha Doherty)

**(Note:** You must make it clear to stakeholders when you are consulting and when you are informing them so there is no confusion)

## Why is community engagement so important?

While all stakeholders are important in 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 environment. With the community's close connection to the land they will be major beneficiaries 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 project. It is never too early to be engaging the community on an invasive plant management project.
- **For Biosecurity actions:** Strong community participation and support is essential in implementing an effective Biosecurity Plan to prevent invasions of the target, or other,

invasive species. The community will make up a large (if not majority) proportion of travelers to the project site. As such they are a major invasive species pathway. The community will need to embrace the Biosecurity Plan and adhere to the prevention techniques when travelling to the project site if the biosecurity is to be successful.

- **As a source of local information:** The community can provide essential information about the project site that will help the team plan the project. Much of this information will be collected during the Feasibility Study stage site visit.
- **As participants:** 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 invasive plant management techniques.

# Biosecurity

## What is Biosecurity?

The purpose of biosecurity is to:

- Prevent the import to the site of seeds/propagules of the species you are targeting
- Keep the site free of new invasive species
- Prevent the export of invasive species from one site to another site.

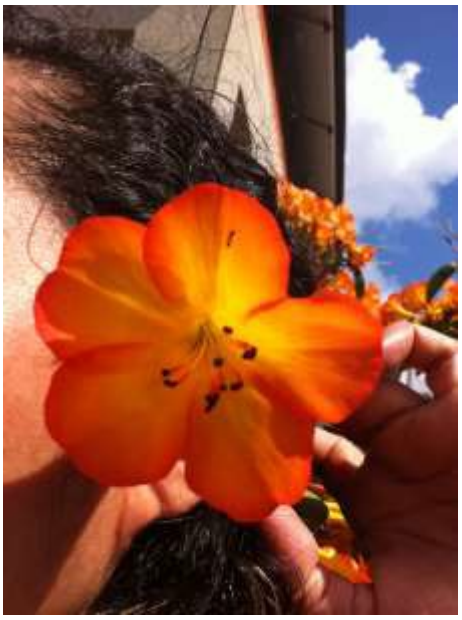
Biosecurity actions are:

- Prevention; keeping invasive species out of sites
- Detection; surveillance for any invasives that get through
- Response; responding to any incursions of invasive species

Remember that removal of one invasive plant species can make the site more vulnerable to invasion by other invasive plants, e.g. removing an invasive tree may make it easier for invasive vines to take over. So the Biosecurity Plan must consider all possible invasive species; not just the target species.

The routes that invasive species take to arrive at a site are called pathways. Most pathways are associated with people and goods travelling to the site by vehicles, boats, or other transport. Therefore much of the detail in the Biosecurity Plan will involve working with the project team and visitors to the site to prevent this happening.

However, plants can also be dispersed by wind-blown seed, seeds sticking to birds and other animals and plant parts carried in waterways; so extra planning and vigilance for these biosecurity pathways is required.



Plant parts can harbour insect or disease hitchhikers. (Photo: Natasha Doherty)

## Why is Biosecurity important?

**Prevention is better than a cure;** the best way of protecting island environments from the impacts of invasive species is to prevent the invasive species getting there in the first place. This will avoid the range of impacts due to invasive species and help retain the environment in its natural state. If we prevent invasions, then invasive species management (the cure) will not be required - saving considerable time and money.

**To give the environment time to recover;** most invasive species management projects are completed as the first part of a programme to restore the native environment of a site. Keeping the project site invasive-free after the project will give the environment time to recover to its natural state.

**To avoid the spread of other invasives;** the last thing a project team wants is to be responsible for the spread of an invasive species at, or the introduction of a new invasive to, the project site. The Biosecurity Plan needs to include plans for preventing the spread of any invasive species throughout the site as well as preventing further introductions.

**To ensure the project is a success;** if a suitable Biosecurity Plan is not implemented as part of an invasive species management project the likelihood of the project being a long-term success is very low. The project itself may well succeed in removing all (eradication) or most (control) of the target individuals, but if a later invasion occurs, all the good work of the project will be rapidly undone. The fact that a project site already has invasive species present is an obvious indication that viable invasion pathways exist and therefore the island is under continual threat of further invasions by existing and new invasive species. Failure to adequately manage this ongoing threat may result in the failure of any project.

**To avoid transporting invasives between project sites and between islands in a country;** in any country which has many islands, the invasive species present will vary from site to site. Only some of the islands may have a particular species of invasive and others may have remained invasive species-free. Visitors to a site that has invasive species must always ensure that when leaving the site they do not help to export the species off the site and act as a pathway for the invasive species to invade other sites or other islands. In projects that involve several sites, it is particularly important that the project team takes every precaution to avoid transporting any invasive species from one place to another. Beware – it is very easy for the project team to become a pathway.

## The 3 lines of Biosecurity defense

**Prevention**

Preventing invasive species from getting to a site, establishing and increasing their population is the most effective measure. Prevention is also sometimes referred to as quarantine and involves identifying the pathways which an invasive species may use to get to a site, assessing the risk of this and applying procedures to minimise each risk. The identification of pathways should be done often, particularly before any travel (including that of the project team) to a site.

All existing and potential invasive species should be considered, i.e. invasive species to be targeted as part of the project, plus any that are not currently at the site but could pose a threat if they got there. Effective prevention means putting as many blocks as possible along different parts of the

pathway to make it very difficult for the invasive species to move along that pathway.

Seeds and other plant parts (and other hitchhikers in the soil) can be transported from site to site by machinery. (Photo: John Mather)

**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 at the site. This is a long-term activity, with on-going or regular surveillance in place at the site. It is different from outcome monitoring which is done to see the effects of the invasive species management activities.

**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 needs 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. wind-blown seeds, a single plant/animal, small group of plants/animals, large number of plants/animals)
- What is the breeding status of the plants/animals? (e.g. seedlings, mature (fruiting) plants, pregnant female rodent, ant colony with queen(s), etc.)
- 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 and from the site, much of the prevention work will

be undertaken not by the project team, but by the wider public and especially local communities and visitors. Get the input of local communities and other site users to help work out biosecurity measures that will be effective in the local situation.

Identify what people value on invasive-free sites (e.g. larger harvest from plants of cultural importance as invasive plants are not competing) so they have an interest in keeping the site invasive-free.

Visitors need to be taught which invasive species threaten the site 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 starting at Stage 2. (help with planning for biosecurity can be found in the Guideline for Biosecurity and Guideline for Stakeholder Engagement).

| 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 | Feasibility Study Report<br>5.2 Sustainable section | Ask is the operation sustainable? Can re-invasion be prevented if the target is eradication? Or can the target species be kept to the level required if the management strategy is control. |
| | 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 | Feasibility Study Report<br>5.2 Sustainable section<br>Appendix: site visit | Implement site visit prevention.<br>Ask is the operation sustainable? |
| Stage 3. Project Design | STEP 3.9 Estimate the Project Costs | Project Plan<br>10 Project Costs section | 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 | STEP 6.2 Continue Biosecurity Prevention | | Continue to ensure prevention measures are |
| | STEP 6.3 Maintain incursion capability | | Prepare the incursion response |
| | STEP 6.4 Continue biosecurity surveillance | | On site surveillance |
| | STEP 6.5 Respond to possible incursions | | Respond to incursion |
| | STEP 6.7 Complete on-going reporting | | 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. It can be qualitative or quantitative monitoring.

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

(Note: monitoring for the presence of invasive species is called surveillance – see below.)
In an invasive species management project there are three types of monitoring:

**Project Outcomes**
As part of the Project Plan you will define the outcomes of the project – the positive benefits of the management of the target species. To evaluate and demonstrate the success of the project you will need to measure indicators and evaluate that information to 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 treatment(s)) that will allow me to show that the project is achieving its objectives?" Select a small number of well-thought-out and meaningful indicators that you can analyse. As outcome monitoring can be time consuming and expensive it is better to concentrate on collecting fewer, better quality data than measuring many indicators less comprehensively.

A baseline measurement is the pre-treatment (before) monitoring to tell you what things are like before the treatment(s) starts. Repeating the same measurements after the treatment(s) enables a direct comparison between the before and after conditions at the site. This provides a clear measure of the effects of the management.

As monitoring involves comparing repeated measurements it is important that the monitoring plan is well thought through and the same measurements are taken each time you monitor, so that you are evaluating the same things (e.g. number of lizards) each time.

The details and work required to monitor project outcomes are recorded in the Monitoring Plan.

Remember - outcome monitoring will always include:

- At least one indicator for each project objective.
- Monitoring of the presence/absence of the targeted invasive species and other newly invaded species (surveillance).
- Monitoring of the outcomes that result from the absence of the target invasive species, e.g.
- positive (and negative) effects on native species.

**Operational**

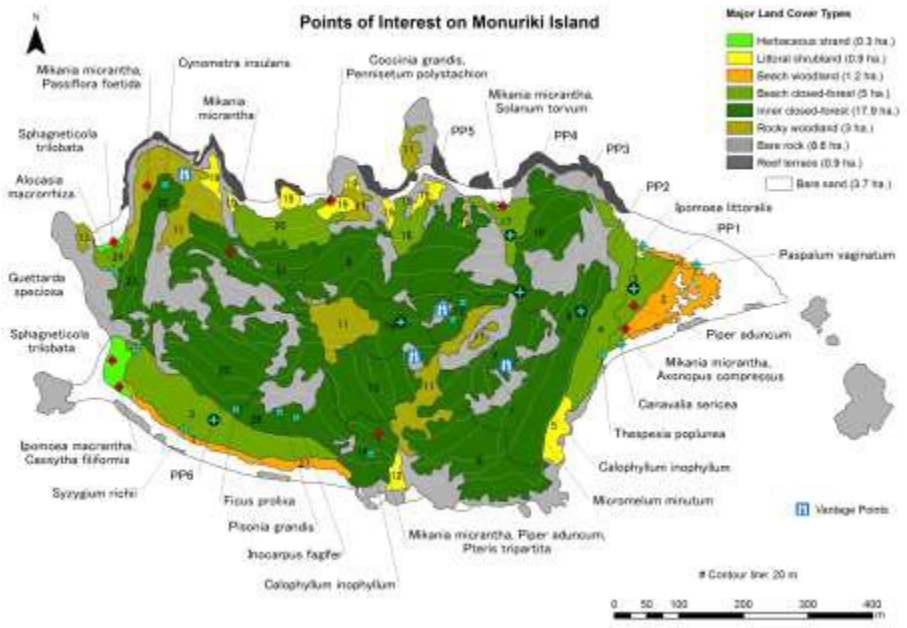
Monitoring will be used in the Operational Planning and Implementation stages as part of the preparation and undertaking of the actual treatment. The detail of the operational monitoring is recorded in the Operational Plan.

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 application rates
- Assessing treatment effectiveness i.e. cut-stump versus hack-and-squirt

During the treatment(s) 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 herbicide used
- Number of plants. Or area, treated




Maps made using Geographic Information Systems (GIS) technology can assist in all types of monitoring. (Map: Shingo Takeda)

**Project Management**

The project manager is responsible for the progress of the project. To review this progress, the project manager will use a set of project management indicators that can be readily analysed. 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, safety of the team and public awareness of the project.

The results from the evaluation will be used to inform senior managers and other stakeholders, e.g. funders, of project status. This will be part of the project reporting. Many funders will make project reporting a condition when providing funding.

Project management monitoring is defined in the Project Governance section of the Project Plan.

## Why is monitoring and evaluation important?

**Evaluate and demonstrate the success of the project:** Monitoring gives you the information to make a transparent and objective evaluation of whether the project has been a success or not. The implementation of a Monitoring 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 meaningful Monitoring 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) will lose confidence in the project if they do not receive a clear evaluation of 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 valuable 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 if the project is going to plan, where it is not, and if action is required.

**If you don't measure it, you can't manage it:** Not collecting essential 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.

| Project Process Stage | Project Process Step | Project Document Section | MonitoringAction |
|---|---|---|---|

## Surveillance

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

- What is the invasive species
- Is there one, or more than one, species?
- What size is the incursion? (e.g. seeds only, a single plant/animal, small group of plants/animals, large number of plants/animals)
- What is the flowering status of the plant (immature/mature)?
- What is breeding status of the animal? (e.g. lactating female; juvenile, adult)
- How long has the species been on the site? (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.

| | | | |
|---|---|---|---|
| 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 section | If unexpected environmental effects or non- target risks are found, it may result in the need to add a new objective & outcomes |
| Stage 3. Project Design | Step 3.3 Update the 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 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 cost |
| Stage 4. Operational Planning | STEP 4.1 Identify stakeholders | | Decide and plan the consultation required for writing the Monitoring Plan |
| | STEP 4.8 Plan the Monitoring | Monitoring 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 5.6 Complete the remaining pre-treatment tasks | Monitoring Plan | Conduct baseline monitoring |
| | 5.9 Conduct the post-treatment monitoring | Monitoring Plan | Conduct monitoring |
| Stage 6. Sustaining the Project | STEP 6.6 Conduct on-goingmonitoring | | Conduct post-treatment monitoring |
| | STEP 6.7 Complete on-going reporting | Final Project Report | Report on outcome monitoring and the evaluation |

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