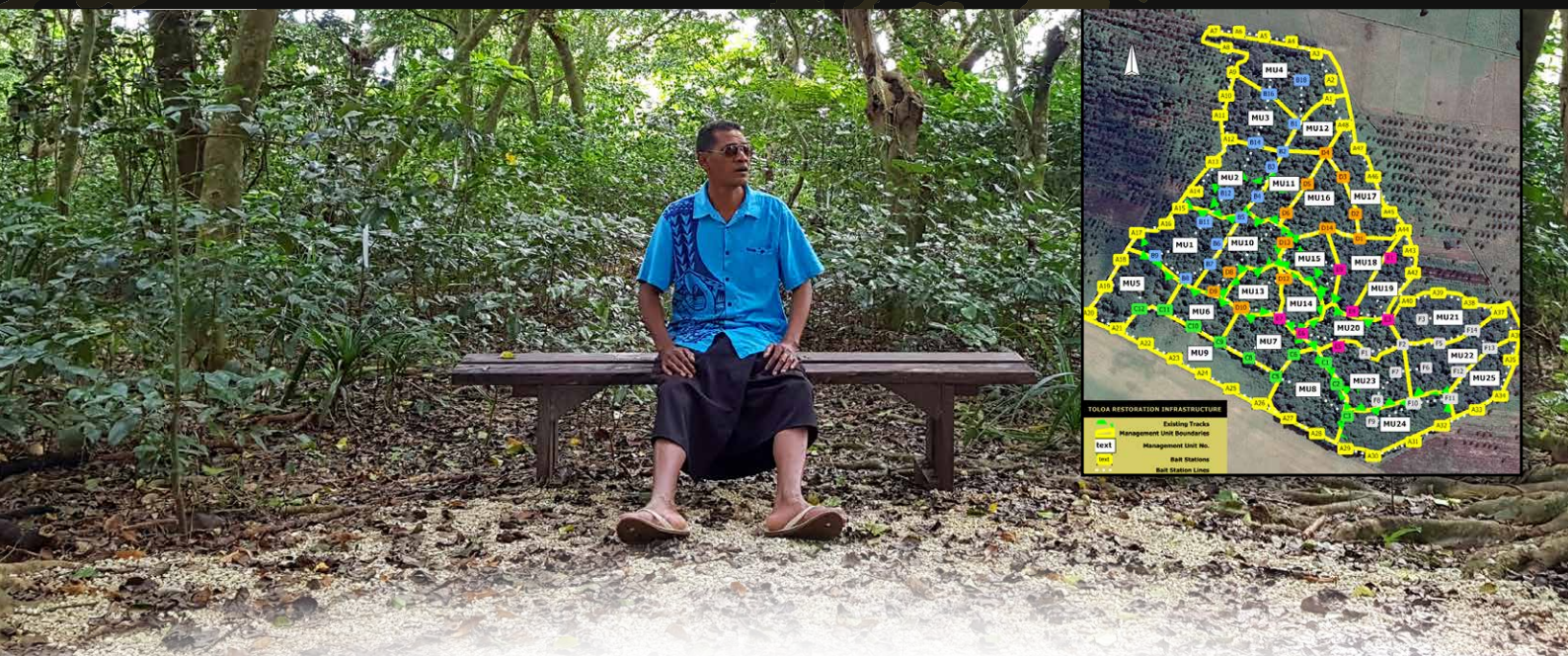
Pacific Invasive Species
Battler Series



BUILD RESILIENT ECOSYSTEMS AND COMMUNITIES BY MANAGING INVASIVE SPECIES IN HIGH-PRIORITY SITES

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TABLE OF CONTENTS

Dear Invasive Species Battler	1
Why manage high-value ecological sites?	2
How do we decide which sites to manage?	2
What kinds of invasive species threaten ecosystems and their services?	3
How are invasive species managed in a whole site?	3
How can we re-introduce ecosystem structure and components?	15
Who should be involved?	17
For more information	17

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Our vision: A resilient Pacific environment sustaining our livelihoods and natural heritage in harmony with our cultures.

Cover photo: The spatial layout of the restoration framework management units and rodent control grid at Toloa rainforest on Tongatapu island, Tonga. Viliami Hakaumotu, Tonga Invasive Species Coordinator, is responsible for the restoration site which also facilitates interpretive tours. Photos: David Moverley, SPREP

Dear Invasive Species Battler

We are a diverse bunch of people in the Pacific region, which spans about one third of the earth's surface and encompasses about half of the global sea surface. We have ~2,000 different languages and ~30,000 islands. The Pacific is so diverse that its ecosystems make up one of the world's biodiversity hotspots, with a large number of species found only in the Pacific and nowhere else. In fact, there are 2,189 single-country endemic species recorded to date. Of these species, 5.8 per cent are already extinct or exist only in captivity. A further 45 per cent are at risk of extinction. We face some of the highest extinction rates in the world.

The largest cause of extinction of single-country endemic species in the Pacific is the impact of invasive species. Invasives also severely impact our economies, ability to trade, sustainable development, health, ecosystem services, and the resilience of our ecosystems to respond to natural disasters.

Fortunately, we can do something about it.

Even in our diverse region, we share many things in common. We are island people, we are self-reliant, and we rely heavily on our environment to support our livelihoods. We also share many common invasive species issues as we are ultimately connected. Sharing what we learn regionally makes us and our families benefit economically, culturally, and in our daily lives.

The "Invasive Species Battler" series has been developed to share what we have learned about common invasive species issues in the region. They are not intended to cover each issue in depth but to provide information and case-studies that can assist you to make a decision about what to do next or where to go for further information.

The SPREP Invasive Species Team aims to provide technical, institutional, and financial support to regional invasive species programmes in coordination with other regional bodies. We coordinate the Pacific Regional Invasive Species Management Support Service (PRISMSS), the Pacific Invasive Learning Network (PILN), a network for invasive species practitioners battling invasive species in Pacific countries and territories, and the Pacific Invasives Partnership (PIP), the umbrella regional coordinating body for agencies working on invasive species in more than one Pacific country.

For knowledge resources, please visit the Pacific Battler Resource Base on the SPREP website: www.sprep.org

Thank you for your efforts,

SPREP Invasive Species Team

About This Guide

This Battler Series publication supports environmental managers in site-based efforts to restore ecosystems and manage invasive species. We thank Hugh Robertson, New Zealand Department of Conservation *Te Papa Atawhai*, for writing the kakerori translocation case study.

SPREP is the lead PRISMSS technical partner for the regional *Resilient Ecosystems–Resilient Communities* programme. The SPREP Invasive Species Team has over 50 years of experience between them executing ecosystem restoration projects in the Pacific, New Zealand, and internationally. This experience includes priority sites within urban areas to nationally significant, larger natural areas and from managing individual sites to wider landscape multi-site projects.

Why manage high-value ecological sites?

Invasive species are the leading driver of biodiversity loss in the Pacific. They impact ecosystem resilience, ecosystem services, and the future ability to adapt to climate change. In the past, the major gap in Pacific invasive species management has been on the ground operational action.

Pacific threatened species and ecosystems often exist within high-value areas on larger islands where invasive animals and invasive plants will continue to be a threat. A site-led approach to manage multiple invasive species and re-introduce lost native species and ecosystem structure over a longer period of time is the last remaining option to restore and maintain these ecosystems.

Site-based action can be used to control multiple invasive species to support the natural regenerative processes of native ecosystem structure and function. Although invasive species will continue to be a problem outside of the selected, intensively managed site, the high-priority site and threatened species within will benefit from holistic management, which might include the re-introduction of species that may have vanished from the site. The native ecosystems in managed sites can be powerful educational tools to research and demonstrate the importance of native species.

Communities directly benefit from resilient ecosystems and are an essential part of ecological restoration. Site-based management aligns well with traditional Pacific land ownership practices.

Many priority ecosystems have been restored over the past three decades, mostly in New Zealand. The Pacific has had several pilot sites that have had very successful outcomes with increases in the abundance of threatened endemic birds.

The limited size of Pacific islands means that invasive species can spread quickly and must be addressed in these priority ecological areas. The PRISMSS partner for this programme is SPREP.

The process of ecological restoration provides an objective approach to increase the resilience of species, ecosystems, and communities through the protection of natural assets which assist in the adaptation to the impacts of climate change.

How do we decide which sites to manage?

While there are no fixed rules, a general guideline is to choose sites that:

- are representative of a relatively intact ecosystem,
- contain endangered or threatened species, particularly those that are only found in that area (endemic),
- rely on natural infrastructure for the supply of ecosystem services to communities,
- are sites of cultural significance and/or provide an opportunity for education or eco-tourism, and
- are accessible or where access is achievable and granted for the long-term.

The perceived value of a site by decision-makers is also important. The restoration of a site that is valued by local communities is a key factor in the long-term success of the restoration project because the community members will need to play a key role in providing support and fostering awareness.

What kinds of invasive species threaten ecosystems and their services?

If you remove the threats to the functioning of an ecosystem, the ecosystem can regenerate itself. Sometimes species will need to be re-introduced to restore a specific functional role.

Restoration focuses on assisting nature rather than trying to work against it or create nature. The removal of invasive species is a key part of assisting an ecosystem to regenerate and provide the desired services.

Some invasive plants have the ability to transform (damage or destroy) ecosystem function. Weeds outcompete more desirable plant species and disrupt processes such as water flow, fire regimes, soil quality, nutrient cycling, and regeneration. Weeds can also be harmful to human and animal health. Weeds thrive on disturbance, and so their harmful impacts are exacerbated by tropical cyclones, strong winds, drought, and fires, all of which are increasing in severity due to the changing climate.

Introduced rats and other predators, such as cats and pigs, alter ecosystems as they consume the seeds, plants, invertebrates, and seabirds that provide nutrients to forest systems and coastal waters. The prevention, control, and eradication of invasive predators are important strategies for supporting ecosystem-based adaptation to the effects of climate change.

Other significant invasive species that affect the function of ecosystems include introduced ants, birds, and other animals.

Other non-invasive species impacts, such as over-harvesting, habitat loss, and natural disasters, may need to be addressed for the health of an ecosystem. However, managing invasive species will potentially reduce these impacts by increasing the resilience of the ecosystem as a whole.

How are invasive species managed in a whole site?

Within the context of an important site, it is best to manage invasive species according to their taxa (different types of invasive species). For example, it is best to manage invasive plants by addressing all species in a systematic way that considers the methods used and the life cycle of plants and that will eventually result in invasive plants reaching zero density. Once zero density of an invasive plant is reached in the site, the resources required to monitor the area for those plants are minimal because the concern is only about newly invasive plants arriving into the area.

The management of rodents is an on-going task because they can easily re-enter the area from adjacent areas. This management component aims to lower the impact of rodents to an "acceptable" level which will allow ecosystem function to resume.

Other invasive species need to be managed also. Although we use separate management components or methods for different taxa, we layer them over the site so that all management efforts are working together to create a sustainable restoration plan and to guide operations.

Control of invasive plants

Managing many different invasive plant species within a restoration site requires a more holistic approach than a single species-led programme. Unlike animals which you can encourage to come to you using bait, plants are fixed in position, meaning that you must search every inch of a site.

Addressing the management of one species at a time under these circumstances is very inefficient compared to working within a framework that enables control methodologies suited to multiple species to be conducted at the most relevant times.

The Forest Restoration Framework is based on both common control methodologies and the life cycle of plants. The framework provides for the most efficient and effective management of multiple invasive plants within a site.

STEP ONE • Site investigation

The first step of creating a restoration plan is a site investigation. Using the restoration framework, it is not necessary to map out every invasive plant, but it is important to note all the invasive plants within the site. Most important is that you identify areas where invasive plant communities exist, where no communities exist, and where invasive plant removal would have significant impacts on the ecosystem.

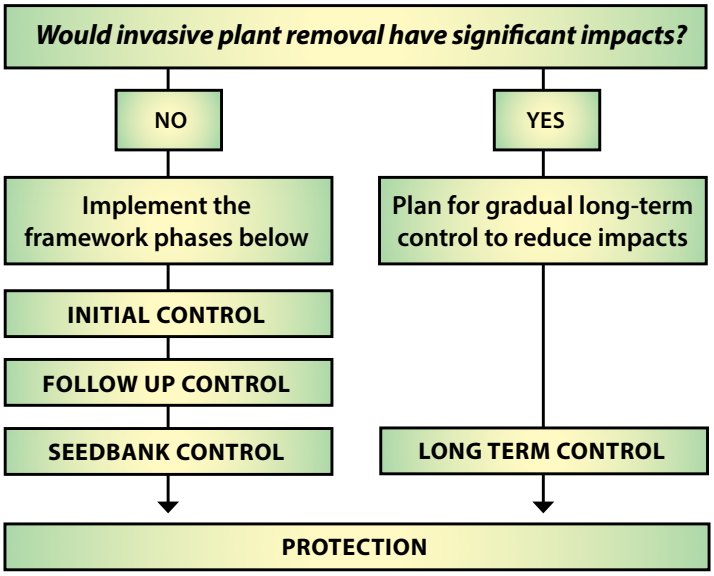
For example:

- *Removal would result in no canopy structure left.*

  This removal would impact the bird species which use the canopy or may result in subsidence if there are no deep-rooted trees left remaining on a steep slope.

- *Control would leave only invasive plants covering a steep slope.*

  Removal of all invasive plants would likely result in subsidence, particularly next to a stream or river.



STEP TWO • Classification of the site into framework phases

Image: David Moverley, SPREP

Draw polygons over a map of the site to indicate the framework phase classifications of the total area. For example, if there are large areas with no communities of mature invasive plants, these areas would be classified immediately as Forest Protection, and the first three phases of the framework would not need to be implemented in these areas. Areas that contain communities of mature invasive plants would be classified as Initial Control.

The ecological area (right) has received isolated invasive plants which have yet to establish local populations. In this instance, the invasive plants have been distributed by birds. This area is indicated by the symbol FP for Forest Protection. Next to the river, adjacent to communities and along road sides, local populations of many invasive plants exist. These areas are indicated by the symbol IC for Initial Control. The record and display of the different restoration phases in a Geographic Information System allows the size of the areas to be determined and provides a means to report on progress as areas move through the framework and the relative area classified as under Forest Protection increases.

STEP THREE • Division into management units

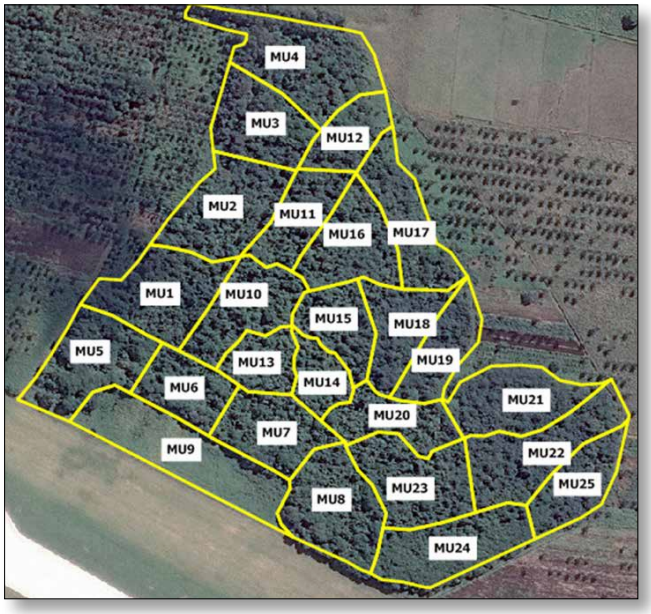


Image: SPREP

The Forest Restoration Framework can be implemented and tracked within sub-classified areas, called management units. This is beneficial when areas are large and the operations are not likely to be completed within a reasonable time to allow the area to be effectively managed as one operation. For example, Initial Control can require a large amount of resources that may not necessarily be available for one operation, so the area designated for Initial Control may be split into management units that are each likely to take one week of operations to complete.

Useful lines to use as the borders of management units are those that are most easily determined on the ground, such as formed tracks, edges of forest, natural features such as rivers, streams, and ridges, or changes in vegetation type.

Management units for Toloa rainforest. The entire area was classified as Initial Control, but the area was too big to operationalise the methodologies required in one session. Image: SPREP

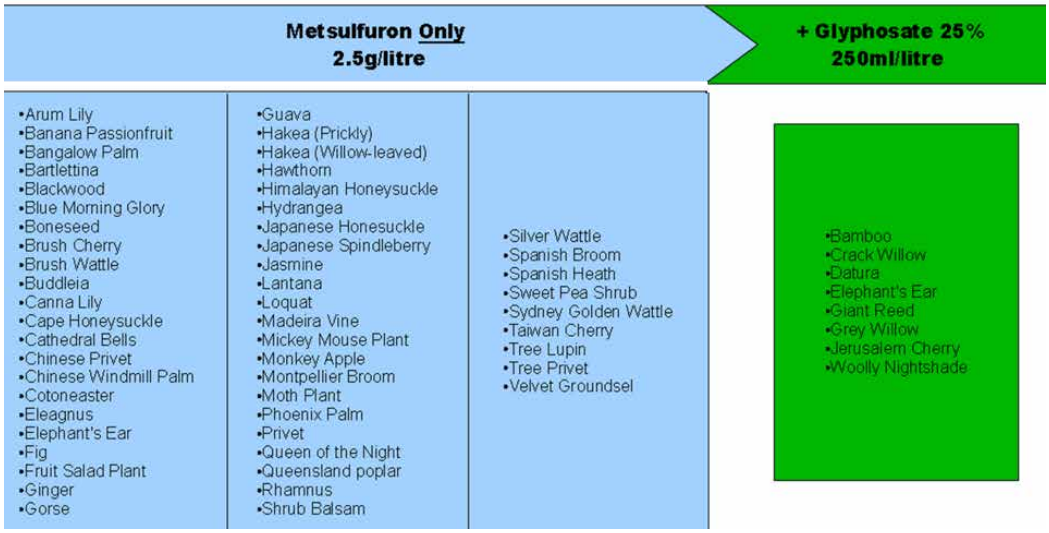
STEP FOUR • Practical implementation of the Forest Restoration Framework

Group the species recorded during the site investigation into those that are going to be controlled (see the Battler guide Manage low-incidence priority weeds to conserve Pacific biodiversity):

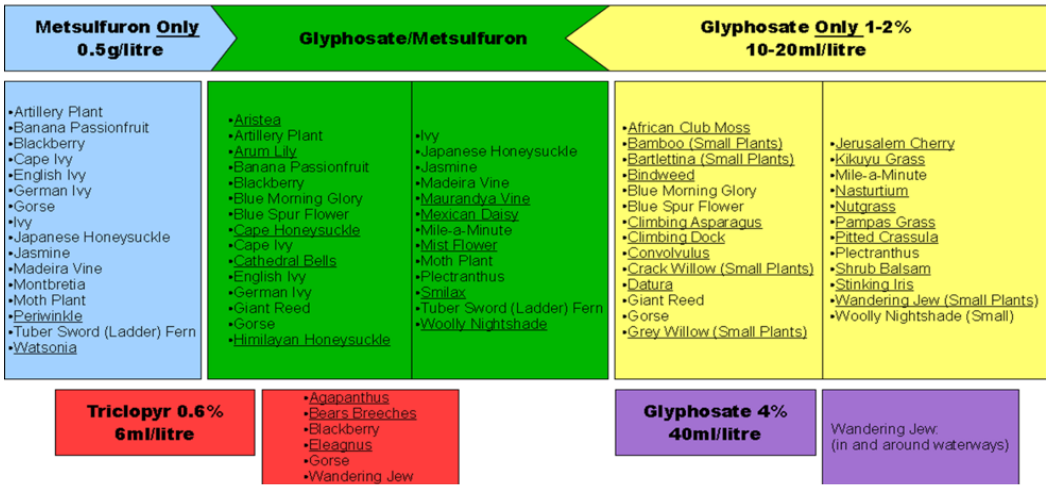
- manually or by applying herbicide to the cut stump or
- by applying herbicide as a foliar spray.

Identify the lowest common application rate of herbicide that will be effective on all species in each group. This is best determined during a herbicide use analysis which assesses what herbicides are available, their effectiveness on the target plants, and their level of risk to humans and the environment. The accessibility of herbicide products and the necessary permits will determine which herbicides are available for use at a given site.

CUT STUMP APPLICATIONS



FOLIAR SPRAY APPLICATIONS



An example of species split into categories by control type and the lowest common rate of effective and accessible herbicides. Images: David Moverley, SPREP

How do I decide where to start?

Setting priorities helps you identify and manage your resources. When deciding on management units in which to begin your restoration programme, it is important to consider several factors, including the amount of resources you have to do the work and the urgency required to lower the impacts the invasive species are having on the area.

Generally, it is wise to focus on two aspects. It is important to *maintain areas within the forest protection phase* so as to not allow invasive plants to mature and form reproducing communities which will spread further. It is also important to *lower the threat* to forest protection areas and minimise further damage to initial control areas by implementing the first three phases in the initial control management units. In reality, it is beneficial to focus on both these aspects as resources permit.

The next decision to make is in which of the many initial control management units to begin implementing the framework. If you have the available resources, then you will manage to complete all management units within a relatively short time, making this decision is not as important. However, with limited resources or in heavily infested areas, implementation may take several years or more. Generally, it is best to limit the existing spread of weeds by targeting the management units adjacent to forest protection areas and working systematically out away from them.

These decisions and others related to the implementation of the project should be addressed and determined at the planning stage.

Initial Control Phase

This phase targets the removal/treatment of species with cut stump methodologies.

Physically releasing native vegetation from invasive vine species and situating the remaining invasive plant material away from native species allows for foliar spraying that strikes the target invasive plants while avoiding non-target impacts.

Applying herbicide during initial control. Photo: Samoa Ministry of Natural Resources and Environment

The team moves systematically through the Initial Control classified management unit in the Toloa rainforest, removing invasive species and stacking the material in piles on sites unoccupied by native plants. Photo: David Moverley, SPREP

Cut invasive vines to separate them from native species and facilitate treatment.
Photos: David Moverley, SPREP

Isolate the target vine or foliar target from non-target plants, minimise the target for foliar spraying, and place the target for easy access with spraying equipment.

Components of the Initial Control Phase	
Current state definition	Invasive plants that transform ecosystem function are present within the area.
Methodology	Systematic manual removal or cut stump herbicide application of all woody species present in the area. Cutting of all vines and releasing them from desirable plants (isolate, minimise, place).
Key skills required	Conscientiousness Teamwork Invasive plant identification Site searching Use of equipment relevant to activities (hand tools, herbicide application, chainsaw) Herbicide management
Key equipment	Hand tools Personal Protective Equipment Herbicide application and management equipment and facilities
Phase duration	Dependent on resources. Typically, the total area will be divided into management units.
Outcome monitoring	Assessments to ensure: all woody invasive plants are dead within the area. Vines are released from native plants and placed on the ground for foliar spraying.
Benefits	Provides immediate positive effects on the ecosystem, improves access, eliminates mature woody invasive plants, and subdues vines.

Follow Up Control Phase

The Follow-Up Control Phase targets invasive plants which require herbicide to be applied by foliar spraying. These are usually herbaceous plants and not woody. Follow-up control may also include large areas of small invasive seedlings, which can take a very long time to manually pull by hand.

Implementing the Initial Control Phase correctly, including isolating, minimising and placing the targets well, will contribute to an effective and efficient follow-up foliar operation. This foliar operation is best done twice to ensure all target plants are dead.

Initial Control (p 7 and 8) compared to completed Follow-Up Control phase (above) shows the targets cut and placement methodology and the effectiveness of two follow-up control operations focused on applying herbicide as a foliar spray. The area is now classified as under Seedbank Control.
Photo: David Moverley, SPREP

Components of the Follow-Up Control Phase	
Current state definition	Invasive plants that transform ecosystem function and require foliar herbicide application are isolated, minimised, and placed ready for foliar spraying within the designated area.
Methodology	Systematic foliar spraying of cut vines and herbaceous invasive plants. This operation is conducted twice.
Key skills required	Conscientiousness Teamwork Invasive plant identification Site searching Use of equipment relevant to activities (foliar herbicide application) Herbicide management
Key equipment	Personal Protective Equipment Foliar herbicide application and management equipment and facilities
Phase duration	Typically, this phase should begin soon after Initial Control has been completed, once the target plants have begun growing again after being cut. The second application should begin once any survivors have also started to regrow. In the Pacific, this phase would likely take six months to complete.
Outcome monitoring	All invasive plants are dead within the area.
Benefits	The immediate threat from invasive plants has been negated. No new seeds are being added to the seedbank.

Seedbank Control

Seedbank control is necessary to target the invasive species seedbank remaining in the soil. Areas enter this phase when all initial invasive plants have been eliminated.

These areas need to be under a management programme prior to germinating plants reaching maturity and until the seedbank is exhausted.

This phase is also the best time to start rodent control because the long-term natural infrastructure, such as trees, will remain intact, allowing the selection of good trap/bait station sites, and the temporary infrastructure (invasive plants) has been removed. This stability will ensure rodent control infrastructure, such as trap lines, is easier to install and does not need to be moved following further vegetation removal.

A management unit under seedbank control (right of track) compared to a management unit (left side of track) which has yet to receive any management on Mt Vaea, Samoa. Photo: David Moverley, SPREP

Components of the Seedbank Control Phase	
Current state definition	All original pest plants that transform the function of the ecosystem are dead. Seedbanks remain in the soil, resulting in germination events within the designated area.
Methodology	Systematic foliar spot spraying or hand pulling of all plants that have germinated from the seedbank. This control is best implemented in the dry season to reduce damage to the ecosystem. This action needs to be repeated following germination and prior to reaching maturity.
Key skills required	Conscientiousness Teamwork Invasive plant seedling identification Site searching Use of equipment relevant to activities (herbicide application) Herbicide management
Key equipment	Personal Protective Equipment Herbicide application and management equipment and facilities
Phase duration	Generally, three to four years, depending on seed viability of the species concerned
Outcome monitoring	Assessments to determine: No invasive plants are reaching maturity.
Benefits	Maintaining ecosystem restoration and function and reducing the resources required for invasive species control.

Forest Protection Phase

In this phase, all invasive plants and their seeds within the area are eliminated. The objective is to control any plants re-entering the area by searching likely sites where they may appear. Likely sites might include fruiting trees, streams, disturbance sites, tracks, and edges.

Components of the Forest Protection Phase	
Current state definition	All pest plants eliminated and the seedbank exhausted. Invasive plants re-enter the designated area from neighbouring locations.
Methodology	Sites prone to invasion (edges, streams, tracks, disturbance sites, and beneath fruiting or perch trees) are checked. Cut stump, foliar spray, or hand pull recently arrived plants. This control should be completed every three to six years depending on the type of plant and the time that the plants take to reach maturity.
Key skills required	Conscientiousness Teamwork Invasive plant identification Site searching Use of equipment relevant to activities (hand tools, herbicide application) Herbicide management
Key equipment	Hand tools Personal Protective Equipment Herbicide application and management equipment and facilities
Phase duration	Ongoing
Outcome monitoring	Assessments to identify: New individual incursions only; No communities of pest plants evident; No pest plants reaching maturity.
Benefits	The ecosystem is able to restore itself with minimal input by managers.

Long-Term Control

Long-term control aims to control the invasive plants gradually over time to avoid adverse impacts on the ecosystem.

Generally, this control involves removing invasive plants within the drip line (the outer edge of the tree canopy) of large trees so regeneration can happen naturally over time within this micro-site. As the natural vegetation establishes to provide further erosion control, areas adjacent to these sites can be managed to remove more invasive plants. The objective is to slowly replace the invasive plants with regenerating native plants to maintain landscape stability.

Planned long-term control of tamaligi trees (standing dead) in American Samoa. Photo: David Moverley, SPREP

Sometimes invasive plants (particularly mature trees) can provide habitat structure for birds, which will encourage perching and the dispersal of native seed into the site. These 'structural invasives' should also be removed gradually, and managers should ensure good native regeneration is evident underneath the tree which can make use of the gap and extra sunlight resources following removal of the tree.

Rodent control

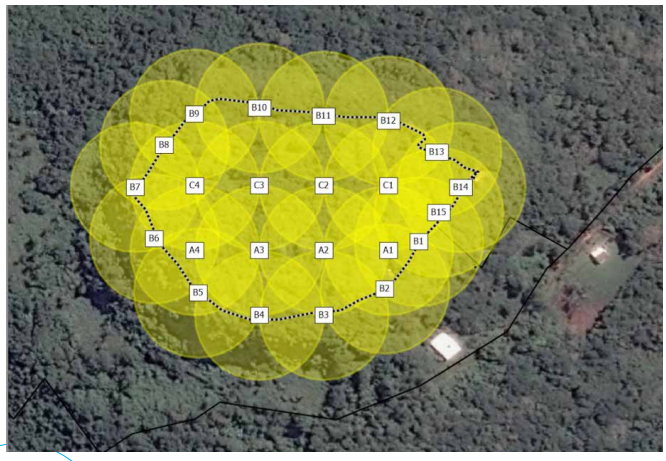
Managing introduced rodents within a restoration site requires the rodent population to be maintained at a very low level so that they do not impact restorative ecosystem processes. The objective is not eradication but on-going maintenance of the population.

To enable this ongoing maintenance, the selected management system needs to be able to affect all the home ranges of each of the rodents. It is therefore best to plan and organise the layout of the control infrastructure within a Geographic Information System (GIS). This information can be transferred to a Global Positioning System (GPS) so that the infrastructure can be placed as close as possible to what is required to provide good coverage, ease of maintenance, and locations that provide security for the infrastructure and are attractive to rodents.

The restoration site of Mt. Talau in the Vava'u Islands of Tonga has seen the native Tongan whistler significantly increase in population since rodent control began in 2015. Seldom seen or heard for a long time, these birds are now heard and seen constantly both within the management area and in the surrounding forests. Although the area of rodent control is only seven hectares and occupies the flat top of the mountain, the benefits have reached the adjacent slopes and surrounding forests of the site. Photo: David Moverley, SPREP

Simple GIS steps to layout the infrastructure prior to installation include:

- Import a background aerial image of the site, such as one from Google Earth
- Import the boundary shapefile
- Import image layers of useful infrastructure, such as walking tracks and roads that will assist with maintaining the control programme
- Create a 50 by 50 metre grid of points over the area and, where possible, align these with existing tracks or frequently used routes
- Buffer each proposed bait station to display the coverage area
- Give each station a unique identification code which relates to the line used for checking stations and the order in which they are in the line. This allows easy confirmation on the ground that you have checked every station and have not accidentally missed one.



The control infrastructure plan for Mt. Talau showing the walking track, station locations, and the coverage area in yellow. The 23 bait stations form three control lines: A, B, and C. Map: SPREP

Components of a rodent management programme	
Current state definition	Young birds, bird eggs, seeds, insects, spiders, and lizards are impacted by rodents. The ecosystem is not functioning well, seeds are not being distributed, the ground tier of the forest is sparse, and bird song is limited.
Methodology	Set up a rodent management grid. Maintain bait stations with rodenticide or traps on a regular basis.
Key skills required	Conscientiousness Identification of native flora and fauna Use of equipment relevant to activities (traps, bait stations, and rodenticides) Rodenticide management (different types)
Key equipment	Flagging tape and marker pen to mark lines and stations Bait stations Rodent traps that fit inside bait stations Personal Protective Equipment Rodenticides and storage facilities
Phase duration	Ongoing; maintenance will be required at least monthly.
Outcome monitoring	Example: Assessments to indicate that birds are successfully breeding; native plants successfully germinating; insects, spiders, crabs and lizards all increasing in population size.
Benefits	Without rodent pressure, the ecosystem is able to restore itself with minimal input by managers.

Filling bait stations. Photo: David Moverley, SPREP

Other invasive species that need to be managed

In addition to weeds and rodents, other invasive species cause serious problems in the Pacific and can threaten a high-priority site. The priority species for management vary among sites.

Some priority invasive species, such as cats, dogs, pigs, and goats, are highly mobile and can directly destroy large numbers of native species. The physical structure of ecosystems can be altered by invasive species that eat plants, burrow, dig, or trample, including pigs and goats. Human health and crops are also threatened by invasive species, including ants, birds, pathogens causing diseases such as taro blight, and invertebrates such as the giant African snail *Achatina fulica* which can carry a parasitic nematode.

The process of management decision-making for these invasive species is similar to that described above for weeds and rodents. A holistic, site-based management plan should consider the possibility of invasion by other species over the long-term restoration.

Feral cats threaten birds, lizards and insects, requiring ongoing management. Photo: Bradley Meyer, SPREP.

Excluding pigs from the last remaining site of *Casearia buelowii* on Mt. Talau, Vava'u Islands, Tonga. Photo: David Moverley, SPREP

L–R *Casearia buelowii.* Photo: Karen Stone, VEPA. Managing feral pigs in Niue through improved hunting capability. Photo: Niue Department of Environment. Managing yellow crazy ants on Atafu, Tokelau. Photo: Paul Craddock

How can we re-introduce ecosystem structure and components?

Following invasive species management, it may be beneficial to improve the shape or structure of the ecosystem to increase the capacity of ecosystem function, decrease the vulnerability of the ecosystem to re-invasion, or re-introduce key species that have become extinct from the site and need assistance to re-populate the area.

Volunteer planting day at Mt. Vaea, Samoa, where locally grown native species are being used to improve habitat shape and structure.

Photos: David Moverley, SPREP

Community release of a Lao banded iguana in the rodent-managed area of Mt. Talau, Tonga. It was found off-site during vegetation management works and handed into the local non-government organisation, Vava'u Environmental Protection Association

Improving habitat shape and structure

Invasive plants are often found on the edges of forest. Their removal may impact the edge of the forest in several ways, including light and wind penetration. Depending on the capacity of this area to regenerate, it may be necessary to re-establish the most suitable native species to fill the roles of edge protection that the invasive plants were previously filling.

Replanting may also be an opportunity to improve the shape of the area so that the boundary is more regular, rather than angular, to reduce the length of the boundary and decrease the likelihood of invasive species penetrating the area. Generally, the individual plants should not be viewed as a permanent part of the ecosystem; rather, they should be chosen for their ability to colonise and create conditions for the ecosystem itself to regenerate.

Re-introducing species that have become locally extinct

Key species, such as birds which disburse native fruits and seeds, may have become locally extinct. For the ecosystem to function properly, it may be necessary to re-introduce these species.

For some restoration efforts, native species that are no longer present in one location might need to be re-introduced, or species that are under direct threat might need to be moved to a safer location to prevent their extinction.

Moving individuals or populations of a species, called translocation, is a serious matter that requires thorough planning, assessments in both locations, consultation, and the completion of all required permitting processes, among other tasks. Any translocation project should include sufficient resources for long-term sustainability and monitoring.

Translocation is often considered a last option, used only when other efforts for protection, conservation, and environmental restoration are not possible or not providing the necessary results to save a threatened species from extirpation or extinction.

The New Zealand Department of Conservation *Te Papa Atawhai* has created guides explaining the translocation process:

- Translocation Basics, see https://www.doc.govt.nz/get-involved/run-a-project/translocation/translocation-success/basics/
- Best practices for translocation, see https://www.doc.govt.nz/get-involved/run-a-project/translocation/best-practice/

If you have identified a population of a native species that is under direct and immediate threat of extirpation and believe that translocation might be required, we encourage you to reach out to the SPREP Invasive Species Team for collaboration with regional experts.

Case study: Kakerori translocation in the Cook Islands

Photo: Kate Beer

The translocation of species to new sites plays an important role in the conservation of many threatened birds. However, the processes and problems involved in planning and implementing such translocations are rarely reported.

In 1989, the kakerori *Pomarea dimidiata* was among the ten rarest birds in the world, with a population of just 29 birds. Rat poisoning in 150 hectares of Rarotonga reduced the pressure on these birds and helped the population grow to 255 birds by 2001. Despite this excellent progress, the kakerori was considered to be highly vulnerable to a catastrophe, such as a severe cyclone or the arrival of a new bird disease or predator via the main port and airport of the Cook Islands.

A second, 'insurance', population of kakerori was established between 2001 and 2003 by transferring 10 young birds each year from the Takitumu Conservation Area on Rarotonga to the 2,700 hectare island of Atiu.

This translocation followed consultation with local communities at the source and recipient sites, an assessment of the suitability of islands in the southern Cook Islands for the kakerori, especially concentrating on the apparent absence of ship rats *Rattus rattus*, and an assessment of the disease risk and possible competition with endemic birds.

The translocation was successful: there were over 123 birds on Atiu in 2018, helped by a top-up of an extra 10 birds in 2011 to increase the population's genetic diversity.

Having established an 'insurance' population, the Rarotongan source population was not neglected. Poisoning of rats in the Takitumu Conservation Area continued each year, and the population had reached 471 birds in 2017.

Who should be involved?

Invasive species are everyone's responsibility.

It is important that the local community be involved at all steps of a restoration programme. Restoration is a long-term objective, and activities such as rodent management will be ongoing. Local communities can benefit from restoration and should take ownership of local restoration work with the assistance of logistical and technical advice.

The Toloa Rainforest Team from Tupou College in Tonga are restoring the 23 hectare forest within their school grounds. They have been trained in plant identification and systematic searching and are supported by the Tongan Department of Environment. Photo: David Moverley, SPREP

The SPREP Invasive Species Team can assist with technical advice, planning, and training through the Resilient Ecosystems-Resilient Communities regional programme within the Pacific Regional Invasive Species Management Support Service (PRISMSS).

For any efforts requiring chemical control, check with your government agencies on which herbicides and rodenticides are available locally or determine the process to obtain the necessary approvals for importation.

For more information

To find out more about managing invasive species in the Pacific, please contact the Pacific Regional Invasive Species Management Support Service (PRISMSS).

Join the Fight

Protect our islands from invasive species