The University of the South Pacific

Cooperative Islands Initiative

Viwa Island Operation Plan: Eradication of Pacific rats, feral cats and dogs (Phase 1), and cane toads (Phase 2)

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AGENCY (CO-ORDINATING)
University of the South Pacific (USP)
and the Pacific Cooperative Islands Initiative (CII)

OPERATORS (CARRYING OUT)
University of the South Pacific (USP)

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Operational Summary

The following table summarises details of the proposed mammal pest and cane toad eradication project on Viwa Island, Fiji.

Location	Viwa Island, Fiji (60 ha) - 30kms northeast of Suva and 0.95kms from Viti Levu.
Primary target pest species	a) Pacific rats (*Rattus exulans*) b) Feral cats (*Felis catus*) c) Feral dogs (*Canis familiaris*) d) Cane toads (*Bufo marinus*)
Target benefit species	Fijian ground frog (*Platymantis vitianus*)
Vegetation type	Dense and open forest, mangroves, ponds and small agricultural plots.
Climate characteristics	Rainfall 1300mm per year on average. Wet/dry season.
Community interests	104 people live on the island – extremely interested in being involved and restoring the island.
Historic sites	Church - First place where the Bible was translated to Fijian and printed. British commemorative memorial to Rev. John Hunt.
Project Coordinator	Dr. Craig Morley, University of the South Pacific, Fiji
Project Manager	Joape Kuruyawa, USP
Start and end date	Sep 05 – Aug 06 (Phase 1), Aug 06 – Dec 08 (Phase 2)
Methods	• Rats - bait stations, hand broadcasting and snap traps • Cats & Dogs – leg-hold traps • Cane toads – to be determined
Biodiversity/conservation outcomes	• Recovery of the Fijian ground frog population. • Recovery of other herpetological, bird, invertebrate and plant species. The island has potential to act as an open sanctuary for conservation education and threatened species recovery.
Socio-economic benefits	• Providing employment (eradication operation and subsequent surveillance and biosecurity) • Improving the water supply and disposal • Improving health standards (reduced risk of leptospirosis) • Improving agricultural output (harvest surplus) • Creating ecotourism opportunities
Capacity development	• Training and skills-sharing – Viwa is very accessible. • Develop quarantine and contingency procedures • New partnerships and initiatives in IAS management. • A model for effective community-based conservation management in Fiji.
Management history	Rat poison has been laid by private home owners in the past. Some rat, cat and dog trapping has been conducted.

1. Introduction

To help restore the biodiversity on Viwa Island it is planned to eradicate several invasive species (Pacific rats, feral cats and feral dogs, and cane toads). These eradications would help protect the endangered Fijian ground frog which is found on only four mongoose-free islands in Fiji (and a small population recently rediscovered on Vanua Levu). There is ample evidence that on other islands Pacific rats have contributed to the decline and extinction of a range of herpetological species. Cane toads are extremely abundant on Viwa (population estimates suggest 250,000+; N. Thomas *unpubl. data*) and they compete with Fijian ground frogs for food, as well as preying upon juveniles and adults (Phil Bishop & J. Mace, *pers. com.*).

The accessibility of Viwa Island to Suva and the University of the South Pacific (USP), coupled with the islands easy terrain and small size (60ha), makes it an ideal site for achieving awareness-raising, community education and research objectives. Viwa also has the potential to become an important eco-tourism destination where people can view several rare endangered species, such as the Fijian ground frog, banded iguana and ground birds. The island could also be established as Fiji's first community-based wildlife sanctuary. This project will also have numerous socio-economic benefits for the people of Viwa by providing employment, improving the water supply and improving health standards.

This operational plan describes the actions required to remove a suite of mammalian pests (rats, feral cats and feral dogs) (Phase 1), prior to the cane toad eradication (Phase 2). Removing these mammals first is seen as critical in developing the appropriate infrastructure and capacity for the cane toad eradication. The mammal eradication operations will help demonstrate eradication techniques to the villagers and will assist in determining whether the island eradication team can sustain a longer eradication project around day-to-day village life. It will also remove any potential interference of rats, cats and dogs from the cane toad eradication. With careful planning, the mammalian eradications are not expected to present major difficulties and can be achieved for relatively little cost (using bait stations, hand broadcasting and traps). An experimental approach will be taken to the eradication of cane toads with progress carefully monitored as the operation proceeds. This will allow for techniques to be adapted and refined as the project proceeds.

2. Outcomes and Targets

2.1 Overall Goal	To restore and protect the native biodiversity of Viwa Island and enhance the sustainability of livelihoods of men, women and children on Viwa.
2.2 Conservation outcome(s)	• Recovery of the Fijian ground frog population. • Recovery of other herpetological, bird, invertebrate and plant species. • Removal of rats from the island is likely to result in a proliferation of forest species, some of which are rare on the mainland (rats affect recruitment of many plants, especially those with large fruits and woody seeds). • The island would also be suitable for reintroductions of birds, invertebrates and reptiles and has potential to act as an open sanctuary for conservation education and threatened species recovery.
2.3 Socio-economic outcome(s)	• Provide employment • Improve the water supply and disposal • Improve health standards (reduced risk of leptospirosis) • Improve agricultural output (harvest surplus) • Create ecotourism opportunities
2.4 Target(s)	• Pacific rat, feral cat and dog eradications • Cane toads eradicated following the mammal eradications. • Ecological monitoring programmes and research initiated and maintained. • Appropriate surveillance and contingency actions implemented.

3. Consultation, Consents and Notification

3.1 Consultation	The Viwa residents have been consulted and actively involved with the planning for this project for the past 3 years.
3.2 Consents and Notification	The following documents are attached as Appendix 1 • Letter of support from Ratu George

4. Methods

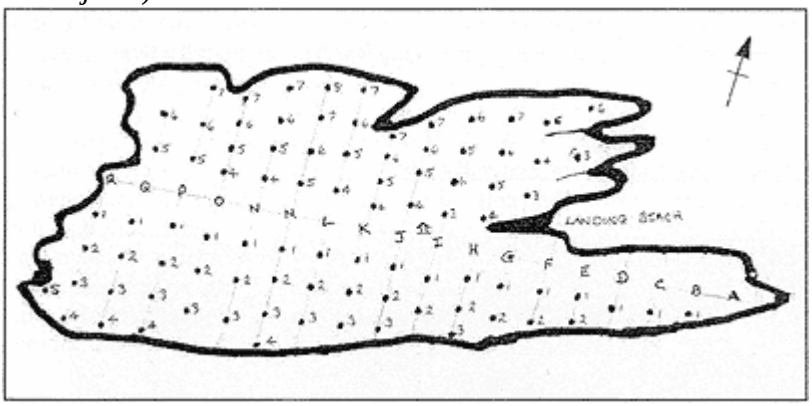
4.1
Summary
Multiple eradications will involve several different techniques. Snap traps will be used around the village to estimate rat abundance and to collect rats for dissection (to identify stomach contents). Hand-broadcasting will be used in areas where access is difficult (e.g. cliffs) and bait stations will be used over the remainder of the island. For cats and dogs leg-hold traps will be used.

For the rats, brodifacoum will be used as the toxin. It is a second-generation anticoagulant toxin that works by stopping the normal blood clotting processes of the body. Brodifacoum is toxic to animals with haemoglobin based blood systems e.g. mammals, and birds) but is not toxic to invertebrates.

4.2
When is the best time for this work?

Operations using brodifacoum take as little as 2-3 weeks to be effective, but 5 weeks is not unusual if an infestation is heavy. The operation length relates to factors such as rat densities, how quickly they started taking the bait, and the density of the bait stations.

Target pest	Pacific rats (cats via secondary poisoning)
Trap style	• Bait stations should be made of cheap lightweight materials, easily installed, inspected and shifted. • It is proposed to use a 4 litre ice-cream-type containers placed just above the ground to exclude crabs. However, it may not be necessary to raise the bait stations if crabs are not a significant problem (but this must be tested in field trials). Two hole's (approx 50 x 50mm) will be cut in the sides of the container to allow the rats access. Lids will be fitted to the containers to avoid the baits becoming wet or contaminated. At the conclusion of this work the bait stations will be utilised in other eradication programmes.
Number required	1500 bait stations will be needed to cover Viwa Island (this includes bait stations in areas of dense vegetation and up in trees etc).
Bait to be used	• Stations will be filled with 40 Pestoff 20R (10mm 2g) brodifacoum pellets (80 grams). Even though people are present on Viwa no Bitrex will be added to the bait as the people on the island have been completely informed of risks involved with using more palatable rat bait.
Bait station placement	• A grid network of 25 x 25m is planned. Some additional stations may be required in areas of dense vegetation and intense rat density (*there should be at <u>least</u> one bait station within each rat's home range*).

	• All stations should be individually numbered so that accurate records of bait take can be kept - write on them in permanent marker and/or use a plastic tag tied to the station or the wire pegs or securely placed nearby. • Lay out bait stations on grids by compass bearing (or GPS). All lines should be parallel, to ensure coverage is even and methodical (*inaccurate location of lines will cause gaps in coverage where rat can persist*). • Select the best trap location within a 1m radius. Preferably near some cover as rats tend to stay near overhead cover (*good bait station placement will mean rats will feel more comfortable about investigating and entering an unfamiliar structure*). • A good track infrastructure is important and each bait station numbered for ease of identification and data collection. This reduces the risk of missing bait stations during checking and allows data collected to be related to bait stations. • Bait stations should be attached to the ground or if crabs and toads are considered a problem then they should be attached to the dry side of trees and posts with the openings 25 -30 cm above the ground. This optimises their use by rats and avoids rain and water splashing off the ground affecting bait quality. • Traps should be placed away from the prevailing weather to prevent wind driven rain from gaining access to entrance and bait. • All areas of the island, except sheer vertical cliffs need to be covered. If areas are inaccessible bait will need to be hand-broadcast over that area (see Section 4.3) • Put the bait stations out 4 weeks prior to the eradication (*rats are neophobic and can take time to get used to new objects*).  Example of a bait station grid
Bait	• Only freshly manufactured bait should be used. Bait that has previously been in the field must not be reused (old baits are likely to have mould growth and be less

	palatable). • If there is any doubt about bait suitability, palatability trials and/or quality control checks (toxin concentration, mould spores, and bait hardness) should be undertaken prior to operation. Non-toxic bait trials will be undertaken several months before the eradication event. • 80 grams of bait (40 baits) should be kept in the stations on a daily basis. However, the volume of bait to be placed in each station may need to be changed if the take by rats is high (or low). • Completely fresh bait should be placed in the stations at least every three days. • Maintenance of fresh bait in the stations should continue until 15 days after last confirmed bait take by rats. • At the end of the operation uneaten bait must be collected and removed from operational area. This reduces chances of rats being exposed to poor quality bait (old) and the time toxin is in the environment.
Operation	• Activity at bait stations may take several days and up to a week to begin, before rats overcome their wariness. However, once bait take starts at any station it usually continues uninterrupted for a period of 3-5 days (this is the expected time it takes rats to succumb to the toxin). Typically, bait take will not occur at all stations at the same time. Rather, it will show a pattern where activity starts at one or more locations and will 'spread' from there, slowly sweeping across the island. • To speed the operation, one or two baits can be placed inside the entrance of rat holes so that rats get a 'taste' for the baits and to encourage them to start to take the bait from stations. • If bait uptake is rapid, the first dead or dying rat may appear after about 4 days and then others should succumb over the following days and continue doing so for several days after the last take of bait. • If all bait has been eaten from a particular point, twice the amount originally laid should be put back. Such 'doubling up' of bait should continue until a surplus is maintained. • Check bait on a daily basis (double loading on Saturday to account for the Sabbath). • Maintain the bait stations in position for 6 months or more after the last evidence of bait take by rats, and periodically check the baits. However, ideally and if possible, leave a small quantity of bait (e.g. a single waxy block) in each station. This bait has the dual role of acting as an additional monitoring tool and killing any rats that may have survived. • It is estimated that one person will be able to check at least

	200 bait stations per day.
Skills required	The Project Manager needs a good working knowledge of rat ecology and prey ecology to manage operations effectively.
Data recorded	Design form needs to be easy to do without confusion. Critical data to record is: • Date • Station number • Number of baits left • Condition of each bait (i.e. not touched, completely eaten, partially eaten), • How many days since last bait take, • Comments (or pictures). Provide a large section for any extra information. This data helps indicate the rate of progress and optimise the amount of bait laid.
Other details about this method	• The method is labour intensive and relatively expensive in the first year because of initial set-up of lines and bait stations. • Bait station design must deny non-target species access to bait. • Bait stations (covers) will carry appropriate warning signs. • Bait stations will be removed at the completion of the operation.

4.3
HAND BROADCASTING

Hand broadcasting bait will be used for inaccessible sites such as coastal cliffs. Hand laying brodifacoum at the specified rate, manner and timeframe poses minimal environmental risk.

Target pest	Pacific rats (cats via secondary poisoning)
Pesticide use	The bait to be used should be Pestoff 20R, containing the toxin brodifacoum
Methodology	Hand broadcasting is to be used in areas where bait station placement is difficult. Typically, these may be ledges, caves or steep faces on the coast of the island, isolated rock stacks/islets and the immediate margins of streams, drains, mangroves and ponds. • Predetermine the sowing rate for the baits (20 kilograms per hectare has been used elsewhere). • Baits should be spread at intervals of 25m, along parallel lines no more than 50m apart (600-750 grams per stop). • Bait should be cast as widely as possible to either side. • If possible, marker flags placed out beforehand will provide a visual guide for accurate coverage.

	• All baits should preferably be spread on a single day, but can if necessary be spread over 2-3 consecutive days. • Use a slingshot to place bait up on ledges/cliffs. • Hand broadcast once a week for 1 month. • Avoid times of heavy rain, continual drizzle, or when the ground is wet (*baits will be damaged by excess moisture and will begin to break down, possibly becoming less palatable to rats*). • Hand broadcasting to be done a few days AFTER the bait station work has begun.
Sowing rate	20 kg/ha
Bait storage	To be kept in a ventilated room. Unwrap bait to stop sweating and always keep the bait dry in a secured room. When handling the bait everyone should be careful not to crush or damage the bait.
Other details about this method	• It is recommended that someone with experience of rat ecology (i.e. favoured habitats), walks as much of the island as possible after the general broadcast. They can place extra baits out as deemed necessary in any area with especially dense rat sign or that was apparently not covered well in the broadcasting. • This poison must not be used, stored or prepared, with any, bait or attractant which is likely to lead any person to believe it is intended for human consumption.

4.4
INDEX TRAPPING and MONITORING

RATS: Index trapping will be conducted prior to, during, and after the poison operation to provide an index of the rat density and reproductive success.

Target Pest	Pacific rats
Method	Snap traps, Tracking Tunnels and Gnaw Sticks
Trap style	Victor professional EZ set supreme (kill (snap-trap), Black Trakka Tunnels, and Gnaw Sticks made of square coconut blocks skewered to No.8 wire stakes
Number required	Traps: 60 + 10 spares. Tunnels: 30 tunnels + 10 spares; Gnaw Sticks: 30 +
Methods	• Three lines of 10 trapping stations (with two snap traps each and a gnaw stick) will be used. • A tracking tunnel will be placed in the vicinity of the paired snap traps. • All traps, gnaw sticks, and tunnels will be numbered and the snap traps tied to a wooden peg by a 15 cm string. • Traps, gnaw sticks, and tunnels will be set in a number of habitats (village, gardens, forest,

	mangroves, etc). • The traps and tunnels will be baited with burnt coconut to attract the rats. • Each snap trap will be used at each site for 3 nights. • The paired traps will be 1 m apart and spaced at 25 m intervals along a line within 20 m of the shore. • Traps are to be placed at sunset and reviewed at dawn to avoid the capture of birds, crabs, and reptiles. • Calculate the ratio of captures/100 trapnights. Trap success is calculated as the number of rats caught per 'corrected' trap night. $\frac{\text{Captures}}{\text{Trapnights-}\frac{\text{captures+sprung traps}}{2})*100}$
Other details about this method	Before leaving the island permanent bait stations (e.g. Philproof bait stations), gnaw sticks, and tracking tunnels should be set up baited with Pestoff 40g wax impregnated blocks.

FERAL CATS & DOGS: If cats and dogs are not eradicated due to secondary poisoning from the rat operation, strategically placed leg-hold traps will be used.

Target Pest	Feral cats and dogs
Control method	Leg-hold traps
Trap style	The key elements are: catch and restrain effectively, minimise injuries (to animals and trappers), easy to use, light weight, portable and cost effective. • Victor #1½ leg-hold traps are recommended. • The holding chain should be centrally mounted underneath the traps (*this reduces injuries by allowing the trap to twist freely with the trapped animal*). • Either a 'bungee' or a spring incorporated into the chain (*these act as shock absorbers, reducing the likelihood of animals pulling out of traps and reducing injuries*).
Trap station layout	• Always set traps out in pairs • Set traps 100-200 metres apart along linear landscape features (fence lines, forest edges, waterways, roads and tracks), in isolated patches of cover and other preferred habitat, and in areas with high prey abundance. • Look for fresh sign when locating additional traps or consider moving those traps which are not catching animals (*individual cats follow particular routes and the areas they hunt can sometimes be very specific, taking the trap to the cat often works*). • Supplementary trapping around buildings, offal pits

	and rubbish dumps is recommended. • A good track infrastructure is important, and each trap station numbered for ease of relocation and data collection. This reduces the risk of missing a trap during checking and allows capture data to be related to each trap site.
Trap setting	Trap location is the most important element of success so traps are to be placed where cats are likely to travel. • Each trap site should have a channel ca 40 cm wide and 80 cm in length, cleared into a bush to create a one-way (blind) trap set. Two traps, slightly offset (approximately 2-5 cm), be positioned at the entrance of the blind set. The free jaws of the two traps are aligned in the centre and almost touching. • Alternatively, chimney trap sets can be utilised (*as cats like climbing into boxes*) and this will also prevent crabs and toads accidentally setting off the traps. • Place traps so the jaws open parallel to the direction of travel. To ensure the animal steps on the trap, the path should be narrowed by placing rocks, sticks, or other obstructions, as close as possible on either side of the trap without touching the trap jaws. This ensures the animal could not step on either side of the trap (*place traps along edges and natural restrictions where several trails came together (e.g., passes, trails through thick brush or high grass*). • Cover the trap with a fine layer of soil and leaves, taking care that this does not stop the trap from closing properly. Disguise with dry leaves (*cats hate dense wet vegetation*). • An obstruction of twigs or small rocks about 5 cm high and 4-6 cm wide should be placed on the path in front and behind the trap. Animals avoid stepping on this guide and step over it directly onto the trap. • Both traps are to be secured in position by a 30 cm length of chain to a 30 cm steel anchor peg. A 12 x 8 x 2 cm foam pad is to be placed below the pressure plate to prevent soil from falling into the trap bed and compacting under the plate. The traps are then lightly covered with soil. • Check traps daily. • Leave traps in position for a minimum of seven days and if no cat activity had been recorded, reposition the traps. • Record evidence of cat or dog activity for each trap site and search for signs *en route*. NB: Cats and dogs that spring a trap without being

	captured may become trap shy.
Bait/lure	Cats and dogs are very inquisitive about other animals in their area; their communication traits are principally reliant on olfactory stimuli. • Where possible, baits should consist of local food sources used by cats and dogs (*they are flexible and opportunist in their diet. The most effective baits will differ with location and their natural diet*). • When bait is used, it should be placed under a rock or bush to avoid attracting scavenging birds and direct sunlight. • Baits should be changed daily (timing depends on environmental conditions) and disposed of away from the trap (*rotting bait close to the trap may deter cats*). • If trap catch rate drops off, changing the bait type may result in more captures (*individual cats can become shy of particular baits through previous missed captures or a natural dislike for a particular bait type*). • For cats scent, made out of a mixture of cat faeces and urine (in a ratio of approximately 1:1) with some glycerin added as a preservative (pongo), may be used later on because it remains attractive to cats longer and does not attract non-target species. • One method to attract dogs (and cats) is to set aside food (pre-feed) in a designated area so the animals become familiar with this food source. This food can be poisoned at a later date or the dogs guided into some corral traps • Judas dogs on heat could also be another method to attract the last few dogs. • Scent made from cats that do not live on the island (i.e., strangers) may be more attractive than scent made from cats living on the same island.
Maintenance of traps	<u>New Traps</u> Clean oil and grease off new traps with hot water. Traps should be treated to prevent traps and chains rusting excessively and take away the shine. Coating should not attract non-targets, and be user friendly. Examples of protective coatings are: • Dipping the traps in heated cooking fat, • Dipping the traps in melted preserving wax, • Soaking traps in fish oil or vegetable oil, • Nothing (in dry conditions), • Traps should **not** be electroplated. <u>Traps in use</u>

	• Traps should be regularly cleaned with a wire brush (*removes mould, fur and bits of dead animals and allows for identifying what has escaped from an empty sprung trap*). • Traps in the field, should be sprung and reset every 1-2 weeks (*un-sprung trigger mechanisms can rust, resulting in slow set-off times which risk missed or poor captures*). • A formalised maintenance regime is important. Traps should be regularly maintained, including checking for worn pivots, weakened springs. Periodic filing of the 'dog' and re-application of the protective coating is necessary.
Dispatching of trapped animals	Animals will be killed humanely following USP Animal Ethics and International Animal Ethics protocols. Despatch techniques should: minimise the potential for escape, reduce the suffering of the animal and minimise stress or injury on the trapper. • Stomach contents will be collected for diet analysis and females examined for placental scarring. The main technique that meets animal ethics approval is: • A blow to the head with a heavy implement followed by cutting the carotid arteries (*this technique requires a quiet approach without unduly disturbing the animal to prevent it pulling out of the trap. The trapper must be confident that they can use this technique*).
Skills required	• The Project Manager needs a good working knowledge of cat and dog ecology and the prey ecology in order to manage control operations effectively. • Trappers should have a good working knowledge of cat and dog behaviour. Specific on-the-job training in the use of traps be experienced trappers will be provided. • A consistently high standard of setting traps is essential – trappers must be dedicated to the work (*cats which escape from poorly set traps are often particularly hard to catch again*).
Limitations	• Individual animals can learn to avoid traps. • Leg-hold trapping is labour intensive and must be checked daily within 12 hours after sunrise. • Non-target interference via removing bait (e.g. crabs) or closing traps (getting caught or setting off) can affect ability to catch cats and dogs.

CANE TOADS

The eradication of cane toads will require multiple methods that focus on 1) the eggs, larvae and tadpoles, 2) the metamorphs and 3) the adults. There are limited waterbodies on the island and these are easily accessible.
NB: These methods still need to be identified and refined but suggestions for each are below.

Target Pest	Cane toad eggs, larvae and tadpoles
Method	• All waterbodies will be identified and mapped. • However, the fate of these waterbodies must be discussed with the people of Viwa. Some waterholes will be filled in, some drained, while others will be fenced off to prevent cane toads from entering or leaving the waterholes. • Rotenone (or it may be possible to use a local Fijian powder from *Barringtonia asiatica*), will be used in waterbodies. The use of *B. asiatica* work will be investigated first, otherwise Rotenone will be used
Details	Sprinkle a known quantity of rotenone (or *B. asiatica*) in waterbodies where the eggs, larvae and tadpoles of cane toads are found. NB: the later stages of cane toad tadpoles may be able to gulp air from the surface so this method may not be as effective against the older tadpoles.
Other	This poisoning work will not affect FGF's as they are direct developers and do not require water to lay their eggs or breed.

Target Pest	Cane toad metamorphs
Method	Use rotenone (or similar) or slaked lime around waterbodies.
Details	Sprinkle rotenone and place slaked lime around waterbodies where metamorphs are found.
Other	Metamorphs are found close to water once they leave it (within 5 metres). Further work on metamorph movement will be investigated by Dr. T. Markwell (from USP)

Target Pest	Cane toad adults
Method	• Traps (water, light, acoustic, invertebrate bait, drift nets, pitfalls)**. All these methods are to be trialled and assessed**. • Fence off all remaining waterbodies. • Hand collection.
Trap details	• Trap specifications include lightweight and portable materials. They must be able to be used in a range of terrains, be able to contain a fairly large number of

	toads, be inexpensive, easy to deploy, and must be useable in the wet season. • Label every trap and record the number and size of cane toads captured per trap.
Fence details	• Waterbodies to large to drain will be fenced. • Fences to be 50 cm high with the top 10 cm of the barrier hanging to the outside to prevent cane toads climbing the barrier (used by the Townsville Frog Society to stop toads getting into frog ponds). NB: Toads are unable to climb smooth surfaces or to jump very well.
Hand collection	• Eradication team workers to collect adult cane toads by hand using gloves.
Euthanasia	All live toads collected will be killed humanely. • The recommended method by most animal ethics committees is by concussion of the brain by striking the cranium, followed by pithing, decapitation or maceration.
Other	

5. Effects on Non-Target Native Species

5.1 Target benefit species	Fijian ground frog (*Platymantis vitianus*) which is found on only four mongoose-free islands in Fiji (and a small population recently rediscovered on Vanua Levu). Fijian ground frogs are impacted by the Pacific rat (*Rattus exulans*), feral cats and cane toads. There is ample evidence that on other islands Pacific rats have contributed to the decline and extinction of a range of herpetological species. Other organisms that may benefit include the banded iguana (*Brachylophus fasciatus*), Pacific boa (*Candoia bibroni*), oceanic gecko (*Gehyra oceanica*), Pacific slender-toed gecko (*Nactus pelagicus*), several skink species (*Emoia cyanura*, *E. impar*, *Lipinia noctua* and *E. concolor*) and birds including the golden dove (*Chrysoenas luteovirens*), many-coloured fruit dove (*Ptilinopus perousii*) and banded rail (*Gallirallus philippensis*). Some of these species could be reintroduced once the operation is completed. It is also likely that the vegetation on Viwa will also benefit from the removal of rats.
5.2 Non-target species	No native species will be at risk at a population level from this operation. However, some species such as crabs and some invertebrates may accumulate the toxin (but the toxin will not kill them). NB: hermit crabs are not eaten unlike the much larger land crabs.

5.3 Effect of operation on native species	Birds may be at risk if either eat insects or dead rats with brodifacoum or ingest baits hand broadcasted (i.e. over cliffs). With minimal use of hand broadcasting, they are unlikely to be affected. All permanent ponds are artificial, although one may be fed by a natural spring. These waterbodies contain a few native fish and invertebrate species, probably dominated by diadromous species that should naturally recolonise these habitats from the sea, or by aerial dispersal of adult insects. This process could be sped up by the translocation of fish from nearby streams on the mainland or fish may be able to be held in artificial ponds elsewhere, during poisoning, and returned to the ponds following the degradation of rotenone.

6. Effects on Non-Target Domestic Animals

6.1 Non-target species	Pigs Chickens
6.2 Effect of operation on domestic and feral animals	Possible secondary poisoning from eating rats, insects, etc that have consumed the poison.
6.3 Additional information	To reduce the possibility of secondary poisoning, the chickens will be caged during and for a limited time after the poisoning operation. The chicken coops must be rat-proof as they could present a gap in our coverage. As the chicken coop has yet to be built this can be incorporated in the coop design. We suggest transferring the small number of pigs to the mainland for the duration of the poisoning campaign to ensure their safety.

7. Tasks, actions, responsibilities and timeframes

<u>Please Note:</u> Operational Plans evolve continuously as some of the unknowns become resolved. Therefore, monthly updates on this OP will be forwarded to the TAG and VSAG, as well as the people on Viwa.

Tasks	Actions	Responsibility	Date
7.1 Identify Implementing Agency - an implementing agency is required to administer the funds and ensure transparency	• Agree on overhead charges (5%) • Define their responsibilities - they will provide telephone, email, computers, financial accounting, vehicle use, lab space, other consumables (printing, power).	Craig Morley	July 05
7.2 Employ Project Manager (PM)	• Advertise and employ project manager – Define duties/who to report to/pay structure/access to a cell-phone, bank card, etc	Craig Morley	Oct 05
7.3 Identify Eradication Team	• Identify eradication team (from Viwa residents + eradication team leader(s)). • Provide the eradication team with training from experienced eradication practitioners.	PM/Craig Morley TAG/DOC	Nov 05 Dec 05
7.4 Establish Communication Methods	• Hire USP film unit to record Viwa documentary. • Regular liaison with local residents and other stakeholders	PM/Craig Morley	Nov 05
7.5 Technical Advisory Group (TAG) meeting - the role of the TAG is to provide independent advice, monitor progress and assess whether the project is on target and meeting its objectives.	• Review the draft operational plan. • Establish measurable milestones and agreed targets and undertake annual independent review to determine whether the project is on track	Craig Morley/Chris Denny/TAG/IEAG/VSAG	Nov 05
7.6 Map Viwa Island - a detailed map is required to identify the location of	• Digitise the outline of the island (using GIS). • Map tracks (and develop track network), identify waterbodies, dwellings, rubbish pits, agriculture	PM	Sep 05

habitat types, problematic terrain, and waterbodies.	plots, etc. • Organise a rubbish clear-up campaign on Viwa (rubbish tips are not only a potential gap in the poison programme, they are a potential health risk to the villagers. • Map all potential cane toad breeding sites. • Permanently mark and correct present track lines at a 25x25m scale • Identify suitable bait station and enclosures locations.		
7.7 Construct house – Viwa residents support the building of a house where visiting researchers and workers can stay. Land has been offered. The CII have promised seeding funds to implement the building of a house through the Tourism Department (for ecotourism).	• Identify appropriate location. • Determine cost. • Engage ecotourism agencies. • Confirm funds for construction. • Construct house. • Purchase chattels (i.e. generator, desk & chairs, bunks, computer, lights, etc).	Craig Morley/PP-CII/Viwa residents	Nov 05
7.8 Purchase equipment	• Determine quantities and costs • Determine timing • Organise shipping • Maintenance requirements (replacement parts)	PM	Nov 05
7.9 Establish research - required to determine if the removal of the mammals and cane toads is beneficial to the islands flora and fauna and what specific changes have	• Collect pre-eradication baseline data for Fijian ground frogs (FGF) (size and numbers), skinks, geckos, invertebrates & plants. • Organise data recording systems and storage methods. All relevant information (including pest invasions, eradications, false alarms, etc) needs to be recorded on a database by the project manager. • Continue FGF mark-recapture work using PIT tags	Craig Morley/PM Taina & Inoke USP students	Sep 05

occurred following the eradication.	• Skinks and geckoes will be monitored using pitfall traps and visual encounter survey (VES) techniques in at least 5 different microhabitats on four occasions during each year. The worked will be carried out by teams of USP students and people from Viwa. • The ground invertebrates will be collected using a motorised G-vac and Winkler sacks. G-vac samples involve collecting 10 samples within each habitat type (each sample consists of 10 sub-samples (= G-vac diameter) run for 10 seconds). Two leaf litter sub-samples (1m x 1m) from each habitat will also be scooped by hand, sorted and placed into Winkler sacks. The later method collects the larger ground invertebrates whilst the G-vac collects the smaller ground invertebrates. • Four permanent quadrats (8m x 8m) will be continually surveyed in key habitats on Viwa and ten 2m x 2m x 1m high rat and CT exclosures (with appropriate 2m x 2m control plots) will be used to monitor any differences in plant growth.		
7.10 Biosecurity and quarantine - biosecurity measures and controls must be imposed before any eradication work takes place to prevent any reintroductions or new introductions on the island after eradication takes place.	• Develop a biosecurity policy for the island following discussions with the Fijian Affairs Board, appropriate ministries and the people of Viwa. • Implement biosecurity protocols to detect and remove any new invasive species arriving on the island. • Establish permanent rat trap boxes in Viwa Village, Solevu boat landing and the area of the island closest to the mainland. • Seal rubbish so pests can not access it and bury biodegradable rubbish at least 15cm deep. • Ensure all alternative food sources (scrap food, offal, pig or chicken	PM/ Eradication team	Feb 06

	food, compost heaps, rubbish dumps, dead wildlife or dead stock, etc) are eliminated or contained as much as possible to limit availability of alternative food for rats.		
7.11 **Rat eradication -** it is proposed that a ground-based rat eradication using bait stations be conducted rather than an aerial bait application that may pose a risk to children, domestic animals and other species on Viwa. The people on Viwa have been well informed in a number of meetings on the island about the possibility of bait poisoning and fully understand the consequences of laying the bait around the island and in the village (see section 4.2 - 4.4 for details on the methods used).	• Cut tracks and mark bait station lines. • Dissect rats. • Establish and run rat index traplines through a variety of habitats (2 transects, stations 20 m apart consisting of 30 traps = 15 paired stations). • Establish tracking tunnel transect lines • Construct and test rat bait stations. • Construct chicken enclosures. The chickens may need to be penned for up to 1 year for maximum safety. • Place order for bait • Finalise bait transportation details. • Organise bait shipment and storage (from Suva – Viwa). • Set out bait stations and label them. • Commence bait applications in bait stations. • Establish quarantine system (set up permanent bait stations). • Follow-up index tracking. • Remove bait stations and dispose of unused bait.	PM/ Eradication team	Nov 05 Nov 05 Jan 06 Jan 06 Jan 06 Apr 06 Apr 06 May 06 Jun 06 Jul 06
7.12 **Cat eradication**	• Searches for cat sign following poisoning operation (*all cats may be killed via secondary poisoning from the rat operation).* • Purchase cat traps • Deploy cat traps • Dissect cats.	PM/ Eradication team	Nov 05
7.13 **Dog eradication**	• Searches for dog sign following poisoning operation. • Pre-feed dogs in order to tame them for capture or poisoning. • Purchase dog traps	PM/ Eradication team	Nov 05
7.14	• Identify metamorph distribution and	USP researchers	Sep 05

Cane toad (CT) eradication – the CT eradication will be conducted after the mammal eradications. The CT infrastructure will be established and trials to determine the best trap method will be tested. It will be necessary to adopt an adaptive approach to develop a range of tools to achieve a successful eradication.	movement pattern. • Experimentally test capture methods/traps for adult and juvenile CT's, in a range of habitat types (water, light, acoustic, invertebrate bait, drift nets, pitfalls). Contact CT experts. • Experimentally test eradication methods for eggs, larvae, tadpoles and metamorphs i.e. use rotenone (derris dust), in and around waterbodies. • Identify humane euthanasia methods (*The Code of Practice for the Humane Killing of Animals under Schedule 1 to the Animals (Scientific Procedures) Act 1986 recommends the most suitable method to kill amphibians (under 1kg) is a concussion of the brain by striking the cranium, followed by pithing, decapitation or maceration in apparatus approved under appropriate slaughter legislation).* • Identity the best method for the disposal of by-products. • Conduct cane toad dissection. • Build CT traps. • Fill in surplus drainage channels and older unwanted waterbodies. • Fence off remaining waterbodies and removing all adult and juvenile CT's. • Determine how long the CT operation will take. • Design exclusion fences. • Begin CT eradication	PM PM/ Eradication team	Oct 05 Oct 05 Oct 05 Nov 05 Dec 05 Mar 06 Apr 06 Apr 06 Aug 06 Aug 06
7.15 Improve water Supply and drainage - the primary objective on Viwa is to minimise (or remove) the	• Commission a hydrology report (includes potential ground water sources, natural drainage systems) (Sarah Davies water engineer – SOPAC). • Investigate methods to improve the drainage to minimise the number of standing waterbodies. Solutions	SOPAC/PM	Jan 06

number of standing waterbodies available for CT's breeding, thereby disrupting their lifecycle (cane toads require water for breeding and for their eggs and tadpoles to develop). A secondary benefit is the provision of a permanent source of clean water and to provide a wastewater disposal system for the village.	include: ▪ Clearing and channelling remaining watercourses (includes villages water issues). ▪ Putting in a bore-hole and solar pump to obtain water rather than using the current standing pools of water. ▪ Improve water storage capacity and collection systems (e.g. roof top rainwater) – by deploying spouting, increasing the number of water tanks and pipes. ▪ Improve waste disposal systems – by developing soakage pits for water, and by constructing composting toilets that do not require water. • Monitor water use over a defined period to ensure there will be an adequate water supply for the villagers. • Identify future funding sources.		
7.16 Monitoring, evaluating and reporting - accurately evaluating and reporting the projects progress will form the basis of whether the VSGC and TAG decide on proceeding with the project past the designated stop/go points.	• Project coordinator and manager to monitor and evaluate progress and provide reports (quarterly). • Provide updates to the media and other interested groups. • Prepare Phase 1 post operational report. • Publish results in local and international journals. • Prepare Phase 2 post operational report.	PM	Sep 06 Sep 08

8. Risks and management

Risks	Management
Public opposition - concerns about the toxicity and persistence of brodifacoum, non-target impacts, and cultural impacts	To counter public criticism, the conservation benefits of eradication (a one-off only operation) will be emphasised in all communications with the public and media.
Conservation impact	Stress that the short-term negative effect on non-target species will be considerably outweighed by the long-term gains for species and ecosystems.
Financial risk	Ensure the budget covers everything that goes into the plan. The Project Manager will closely monitor operational expenditure.
Re-invasion by rats or cane toads or invasion by mongoose	The risk of re-invasion will be countered by improved quarantine practices for the island and also by following best practice in setting up an ongoing monitoring and surveillance programme.
Rats not eradicated - there is a chance that not all rats on the island will come into contact with the bait stations	Ensure bait coverage over the entire island.
Staff risks	Safety issues will be identified in this plan and safety procedures will be enforced with one team member having a specific responsibility for safety issues.
Operational risks- this operation is dependent on a large number of variables there is a potential risk of not achieving eradication. The risk is however more than offset by the potential conservation gains that will be made if eradication is achieved.	Ensure the operation is planned and implemented correctly. Identify problems and develop contingency options. All risks will be updated, minimised, and as far as possible quantified, as the planning for this operation proceeds. A failed operation would harm existing political and public goodwill towards island eradication operations and would make it more difficult to obtain support for future operations. Funding may also not be as forthcoming.
Bait deterioration	The best practical options for bait storage will be used. All precautions with bait during transport will be taken including checking the bait prior to leaving the factory, again at the point of departure and ongoing monitoring on the island. Transport bait, shrink wrapped on pallets from NZ to Fiji. The bait will then be stored in a refrigerated room for a designated quarantine period, after which time it will transported to Viwa Island by vessel. There will be a chilly bin in the base on Viwa to be used for storage. Bait will be inspected every day by the project

	team for condensation and pest damage and will be dried if necessary. Rodent damage to bait will be minimised by a layout of snap traps that will also be checked on a daily basis by island staff.
Lack of support from stakeholders, particularly local residents	The people of Viwa have title to the land and have given their permission to proceed with the eradication work. The Viwa Stakeholder Committee has been formed to ensure ownership and involvement of local residents (and NGO's and government agencies). A strong relationship has been established with the Viwa Islanders by USP researchers who have consulted considerably with Viwa residents over the past 3 years.

9. Project management structure (roles and responsibilities)

Implementing Agency: School of Pure and Applied Science (University of the South Pacific)

Project Coordinator: Dr Craig Morley

Project Manager: Joape Kuruyawa

Eradication Team Leader: Local villager

Eradication Team: Scientific experts and local villagers

Roles and responsibilities

Stakeholders	Roles	Responsibilities
University of the South Pacific (School of Pure and Applied Science)	Advisory capacity, management, supervision, administration & scientific expertise	• Act as implementing agency • Recruit Viwa staff and student workers • Coordinate with project manager, payment of expenses/wages, work with the VSC
Project Coordinator	Project coordination	• Oversee the project • Hire project manager • Fiscal responsibility • Review research & reports
Project Manager	Overall management of the project Coordinate, plan & manage work on Viwa (including monitoring and experimental work)	• Liaise between TAG, VSC, project coordinator and others • Public spokesperson & handling media and other enquiries • Manage Viwa staff • Acquire materials (bait) & tools for work • Monitoring & evaluation. • Financial management.

		• Ensure work targets are completed • Record data and write progress reports
Viwa Stakeholder Committee	Advisory capacity	• Advise of the operational plan. • Oversee the project success. • Obtain governmental support.
Viwa residents	Land owners, decision makers, workers	• Oversee the project success. • Provide workers and local knowledge.
Eradication Team Leader	Arrange eradication operations	• Back up support for all major tasks as outlined for PM above • Day to day island programme management • Organise workers and equipment • Health and Safety monitoring of all operational tasks.
Eradication team	Establish trap lines Eradicate target animals	• Cut transect lines, set and bait traps • Set up and storage of bait and maintenance of bait quality • Rodent control around bait storage site • Record bait take & capture rates • Maintain bait stations & exclosures. • Trap cats and dogs. • Help with cane toad trials.
CII	Assist project coordination/manager Funding management	• Help prepare the Operational Plan • Initiate the implementation of the project and provide support.
TAG	Provide technical advice for the operational plan	• Advice and support for operational planning
Department of the Environment	Advisory capacity, scientific knowledge & island visits	• Oversee the implementation of environmental practices (FBSAP), threatened species management.
Native Land Trust Board	Advisory capacity & island visits	• Oversee the implementation of native land issues.
The National Trust of Fiji	Advisory capacity & island visits	• Oversee the implementation of species management & Fijian protocols.
Fijian Affairs Board	Advisory capacity & island visits	• Oversee the implementation of Fijian protocols & protection of traditional and customary rights.

Conservation International	Advisory capacity, funding & island visits	• Oversee the implementation of the project for C.I.
Environmental Consultants (Fiji) Ltd	Advisory capacity & scientific expertise	• Oversee the implementation of the project as an objective scientific observer.

10. Budget

Viwa Budget (NZ$$)	Cost	Qnty	Year 1	Year 2	Year 3	Total
MEETINGS						
Viwa Stakeholder Committee meetings - At least 3 meetings per year – in Suva or on Viwa						
Transport – Boat ($40) Taxi ($60)	100	9	300	300	300	900
Lunch/dinner- 8 people at $25 each (3x/yr)	25	24	600	600	600	1800
Kava (sevusevu and i tautau)	60	6	120	120	120	360
Technical Advisory Group meetings - at least once per year						
Flights (2 pp) from or to Fiji from NZ or Oz	2000	1/yr	4000	4000	4000	12000
Accommodation & food (2 days)	600	1/yr	600	600	600	1800
ACCOMMODATION ON VIWA						
Deposit for house (Provided by Tailevu Provincial Office)	6000	1	6000			6000
Land (provided free by the village)	0	1	0			0
Construction costs (labour)	2500	1	2500			2500
Chattels (lights, table, chairs, bunks)	1500	1	1500	500	500	2500
Food for project manager and two others (at least 3 weeks/month) (3 people at 21 nights per month x 12 months at $10/night)	10	756	7560	7560	7560	22680
Generator cost - $5/night	5	252 days	1260	1260	1260	3780
Kava (sevusevu and i tautau)	60	36	720	720	720	2160
VEHICLE AND BOAT COSTS						
Project coordinator, project manager and 2 others – return trip $60 (taxi)	60	3 yrs	720	720	720	2160
Miscellaneous trips (building supplies, bait stations, traps, etc)	100	3 yrs	720	720	720	2160
Boat costs ($40 return)	40	3 yrs	480	480	480	1440
Barge hire	250	2	250	250		500
LABOUR COSTS						
At least 4 full-time people to conduct eradications and assist with cane toad experiments (construction of fences, traps, etc) at $20/day for 45 weeks	480/wk	45 wk/yr	21600	21600	21600	64800
Taina and Inoke to continue FGF survey work -$20 each for 2 nights/week	40	100 dys/yr	4000	4000	4000	12000
Project manager	25000	3 yrs	25000	25000	25000	75000
Experts (rat, cat, dog trappers, etc) for skill sharing	2500	5	7500	2500	2500	12500
ERADICATION INFRASTRUCTURE						
Mapping - aerial photo, GPS and map production	Various	1	1000			1000
Scrub bars, spare blades and nylon, and	2000	1	2000	1500	500	4000

safety gear for clearing tracks						
Axes	50	4	200			200
Permanent track markers	300	1	300			300
Wheelbarrow	225	2	450			450
Fuel containers	40	4	160			160
Water pump - Large bore/low pressure and small bore/high pressure	1000	2	2000			2000
Water hoses	250	2	500			500
Community notice board	100	1	100			100
Construction of chicken cages	10	30	3000			3000
Fuel for scrub bars, water pumps, etc	1000l?	1.60l	1600	1600	1600	4800
WATER SUPPLY						
Materials - guttering, drain pipes, brackets, glue	Various		12000	3000		15000
Water tanks – BT1800 = 1800 litre capacity (diameter 1330, height 1380mm)	684	7	4788			4788
Cement (for wells, bathing ponds, etc) 50kg bag	20	40	800			800
SOPAC & others advice $250/day	250	8	2000	1000		3000
RAT ERADICATION						
Rats traps (during pre-poisoning index trapping, post poisoning monitoring period)	5	40	200			200
Bait stations (1750 @ $2/station)	2	1750	3500			3500
Hand drill	100	2	200			200
Philproof permanent bait stations	16	30	480			480
No 8 wire (for pegs) 1.5 m /station = 2500 metres– 12m length	7	34	238			238
Bolt cutters	70	1	70			70
Pestoff Rodent Bait 20R (20ppm brodifacoum) - 25x2g baits x 1750 stations = 87.5 kg per bait station fill. If 25 refills required (one each 2 days max) then 2188kg of bait required. 10kg pestoff pellets is $56.25 (inc freight in NZ)	12300	1	12300			12300
Development of a biosecurity protocol between the mainland and Viwa	500	1	500			500
Containers for storing bait	10	20	200			200
Rubber gloves (for bait handling)	10	5	50			50
Stanley knives	10	2	20			20
Permanent marker pens	3	10	30			30
Vitamin K1, 20mg oral doses (in case of accidental poisoning)	10	10	100			100
30m tape measure	60	4	180			180
Compass	15	4	60			60
Roll of baling twine (for hanging bait stations)	5	4	20			20
Waterproof notebooks	4	10	40			40
Freight of bait and equipment from NZ to Fiji – including cartage	2000	1	2000			2000

CAT ERADICATION						
Cat traps - 1.5 Victor leg holds	25	40	1000			1000
Cage traps (26 x 9 x 9)	100	10	1000			1000
DOG ERADICATION						
Dog Food	100	1	100			100
Air freight of bait and equipment from NZ to Fiji - including cartage	2000	1	2000			2000
CANE TOAD ERADICATION (SET-UP)						
Rotenone – concentrate in 5kg bags	10	100	1000	1000	1000	3000
Cane toad traps (1000 @$20/each) and maintenance and repair	20	1000	1000	19000		20000
Spades	50	4	100	100		200
Buckets – 30x20cm	9	100	200	700		700
Torch lights – Eveready	13	50		750		750
Rechargeable batteries – 4 x AA	10	50		500		500
Battery recharger	70	10		700		700
Polythene sheets (60 m roll)	57	3		171		171
Ryobi mulcher/blower vac 31cc - petrol	450	1		450		449
Cane knives	15	10	5	225		225
Wheelie bin	115	3	115	230		345
Exclosure plots- timber, frames, wire, mesh, etc	Various	4 plots		12000		12000
RESEARCH COSTS						
Scholarships	10000	1	10000	10000	10000	30000
MISCELLANEOUS ITEMS						
Administration costs (photocopying, phone & fax costs etc.)	1500	1	1500	1500	1500	4500
Conference proceedings (flight, fees, etc)	3000	1	3000	3000	3000	9000
Documentary - USP at cost	13500	1	4500	4500	4500	13500
Translation services (for interpreters in the village, when in discussion with the local landowners about the project and progress, and for a final report in Fijian)	20	25	1000	1000	1000	3000
First aid kits, field guides, torches, batteries, etc	Various		600	300	300	1200
SUBTOTAL A			163636	134156	94080	
5% USP OVERHEADS			8181.8	6707.8	4704	
GRAND TOTAL			**171818**	**140864**	**98784**	**411466**

11. Acknowledgements

Firstly, we would like to thank the people on Viwa Island for their hospitality and warmth. It was a pleasure to spend time on the island, especially during the farewell ceremony. Particular thanks to Pou (Ilaitia Ratuvou) and his wife Vasiti for looking after us during our visit. Also we appreciate the translation services and sense of humour of Joape Kuruyawa.

Lindsay Chadderton, Jean-Marc Hero and Michael Mahoney for their contribution to the project plan.

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Appendix 1: Consents and Proof of Notification

Insert copies of all consents and notification letters specified in Section 3.2.

From Ratu George N. Komaisavai (Roko Tui Viwa) (The Roko Tui is a Fijian in charge of a district or area (high chief)).

Viwa
Bau
Tailevu

11 April 2005

Doctor Greg Molly
School of Pure and Applied Sciences
Biology Department
University of the South Pacific
Suva

Dear Doctor Greg

re: **CANETOAD/RATS ERADICATION**

Bula vinaka Doctor Greg. We have met once in 2004. I have often been updated on the progress of your work and I must say that I am impressed. The people of Viwa are indeed grateful for natures gift to this island and the international attention that your project is bringing to the island. I wish to assure you of our continued support for as long as it takes to make the project a success.

I understand that you are planning to build a boarding house and that a site has been recommended and has received your approval. The arrangement with regards to the use of this house, as suggested by you is encouraging.

It has been brought to my attention that you are planning two eradication programme.

a) CANE TOAD ERADICATION and
b) RAT ERADICATION

I am recommending that you begin with the eradication of rats because it is the smaller of the two projects.

Rats are not only a domestic problem but they have been responsible for destroying our mature root crops.

I do not wish to interfere much with your work however I hope that you will agree with the recommendation.

Kind regards.

Ratu George N.Komaisavai
Roko Tui Viwa

Appendix 2: Logframe matrix

Summary	*Indicators*	**Means of verification**	**Risks and constraints**	**Risk management**
OVERALL GOAL: Provide a model of a community based collaborative conservation project which will lead to social-economic, as well as ecological outcomes, being achieved and sustained on Viwa Island, Fiji.	- Tangible benefits for men, women and children on Viwa. - Capacity of management agencies increased in Fiji. - Endangered species protected.	- Progress reported against objectives in the Fiji NBSAP. - Feedback from community discussion.	- Lack of support from government agencies and stakeholder groups. - Impacts of IAS not recognised. - Results of IAS management not linked to wider outcomes.	- Awareness raising about the significance of IAS and links to biodiversity and livelihoods. - Formation of the Viwa Stakeholder Committee. - Provision of information to support national and local actions.
GOAL 1 To restore and protect the natural biodiversity of Viwa Island.				
Objective 1.1: To eradicate rats, feral cats and dogs, and cane toads from Viwa by December 2008.	- No rats, feral cats and dogs, and cane toads on Viwa on completion of the project. - Increase in biodiversity.	- Results from USP (and others) studies. - Monitoring and surveillance detect no rats, feral cats and dogs, and cane toads following eradication. - Reports from Project Manager.	- rats, feral cats and dogs, and cane toads not eradicated. - Lack of knowledge, skills and technology to manage IAS. - Lack of interest and commitment from key stakeholders. - Risk of IAS re-invasion.	- Project manager to coordinate eradication and promote communication. - Provision of training and skill-sharing opportunities. - Ensure ownership and involvement of the local people. - Effective quarantine procedures in place. - Peer review to ensure correct protocols followed.
Objective 1.2: To measure any changes in the FGF population following CT (and other vertebrate) eradication and relate these changes to pest impacts.	- Measurable increase in the FGF population following eradications.	- Results from USP (and others) studies.	- No observable change in FGF density.	- Suitable scientific monitoring regime in place.
Objective 1.3: To determine any other changes in plant and animal populations on Viwa which might be related to the eradication.	- Positive or negative changes in plant and/or animal populations on Viwa. - No loss of native species on Viwa.	- Results from USP (and others) studies. - Survey of biodiversity before and after eradication.	- Insufficient data to record a change in plant and/or animal populations.	- Project support for scientific and other activities as necessary.
Objective 1.4: To promote appropriate on-going ecological monitoring and relevant research.	- Projects on Viwa conduced by students (USP/Griffith).	- MSc/Hons projects completed. - Papers	- Students fail to complete projects. - Papers	- Ensure adequate supervision. - Peer review prior to

	- Papers/reports published.	published in peer-reviewed journals.	rejected.	submission.
GOAL 2 To enhance the livelihoods and lifestyles of Viwa residents by improving domestic water supplies, reducing pest impacts and creating opportunities for new land uses on the island.				
Objective 2.1: Improve domestic water supplies and wastewater disposal on Viwa Island.	- Domestic water supplies (drains, tanks, toilets) improved. - Peoples health improved.	- Increased water storage capacity. - Feedback from the community if their health has improved pre and post water supply improval.	- No improvement in domestic water supplies. - Lack of care/vandalism. - Health not improved.	- Ensure suitable water agencies involved. - Ensure ownership of the water facilities (not a gift).
Objective 2.2: Increase the availability of food (both agricultural and household) by eradicating rats.	- Crops less affected by rats (agricultural output increase). - Less household food wastage. .	- Feedback from gardeners if crops are less affected (by rat impacts). - Less waste from household food.	- Neither crop yields or household waste measured.	- Ensure crop yields and household waste recorded prior to eradication.
Objective 2.3: Provide employment opportunities for local people (eradication operations and associated monitoring, on-going surveillance and quarantine programmes).	- Local people employed. - Enhanced livelihoods by Viwa residents	- Viwa residents are employed on the eradication project. - Village becomes more prosperous.	- People do not do the work or the work is poorly done. - Commitment lags over time.	- Ensure suitable payment. - Ensure ownership of the project. - Project manager to provide support and guidance.
Objective 2.4: Removal of Fiji's principal carrier of leptospirosis (rats).	- No rats present. - Improved health. - Lower/no cases of leptospirosis.	- Health survey. - Lower/no cases of leptospirosis.	- Leptospirosis (and other diseases associated with rats) still present.	- Eradicate all rats. - Awareness raising of the impacts of rats.
Objective 2.5: To promote nature tourism opportunities created by a pest free Viwa Island.	- Increased number of tourists visit Viwa.	- Accommodation and other resources available for tourists on Viwa. - Increased number of visitors. - Feedback from community discussion.	- Tourists use islands resources (water). - Increased risk of re-invasion.	- Limit tourist numbers. - Effective quarantine.
GOAL 3 To develop new capacity to eradicate cane toads (and other vertebrates) and to refine quarantine and contingency procedures for inhabited pest free Pacific island.				
Objective 3.1:	-Effective	- Cane toads	- No effective	- Ensure expert

To determine the most effective techniques to detect and remove cane toads and to assess the costs and benefits of these eradications.	techniques to detect and remove cane toads found.	detected and removed.	technique found.	input in project design and development.
Objective 3.2: To develop effective and appropriate surveillance and contingency actions and empower local residents and relevant agencies to consistently apply them.	- Surveillance and quarantine procedures in place. - People do not transport rats, cats, dogs or cane toads to Viwa.	- Surveillance and quarantine procedures are effective.	- Risk of re-invasion. - Ineffective surveillance and quarantine procedures (not all cane toads detected). - Relevant agencies unaware of the project.	- Ensure surveillance and quarantine procedures in place and are followed. - Ensure community ownership of the project. - Project manager to inform relevant agencies of progress.
Objective 3.3: To analyse results and outcomes and report these to appropriate audiences.	- Results published in reports/papers.	- People are aware of the Viwa project - Results are published in reports/papers.	- Results not collected properly. - Incorrect audience identified. - People unreceptive to information.	- Ensure adequate peer review process. - Ensure reports aimed at the target audience. - Develop strategy for information dissemination.
Objective 3.4: To promote appropriate cane toad management activities based on the outcome of the Viwa project.	- Cane toad eradication project successfully managed on Viwa. - Future invasions are dealt with in-country.	- Cane toad eradication template created for use on other islands - Results from Viwa disseminated.	- Management procedures on Viwa not checked - Cane toads not eradicated.	- Ensure management is audited and appropriate for Viwa.
Objective 3.5: To provide a demonstration site to teach invasive species management techniques, and benefits of pest eradications.	- Awareness of invasive species increased.	- Government agencies include IAS management in policy. - Schools include IAS in curriculum.	- No increase in awareness. - Lack of communication between the project manager and others.	- Have a suitable communication strategy. - Ensure all parties are kept informed throughout.

Appendix 3: Contact details

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