

Pest Management Plan

May 2012

CEPF Grant 60908

FAUNA & FLORA INTERNATIONAL

***ISLANDS WITHOUT ALIENS: BUILDING REGIONAL CIVIL CAPACITY TO
ERADICATE ALIEN INVASIVE SPECIES***

ANTIGUA & BARBUDA and SAINT LUCIA¹

¹ This plan applies to Saint Lucia only. For Antigua & Barbuda, see Pest Management Plan for Antigua and Barbuda, submitted by the Environmental Awareness Group (GEM #60933), May 2012

Pest Management Plan

Objective

The pest management plan (PMP) will describe CEPF requirements to ensure the use of best practice in the control and removal of alien and invasive plants, insects, and animals in compliance with World Bank Safeguards. This is included in the CEPF Operational Manual.

The objective of these guidelines is to avoid, minimize, or mitigate potentially adverse effects of the application of pesticides, insecticides, and herbicides (herewith referred to in the unitary as “pesticides”) in efforts to restore natural habitats.

This document describes the requirements and planning procedures for applicants/grantees in the preparation and implementation of alien and invasive species (AIS) control projects funded by CEPF, as well as the role of CEPF in ensuring compliance with these guidelines.

The spread of alien and invasive plants and animals is the second greatest cause of biodiversity loss after habitat destruction. In the context of CEPF, many of the KBAs and corridors targeted for investment suffer from, in particular, non-native plants which have opportunistically taken over natural landscapes, and from non-native animals that upset island ecosystems. Many Ecosystem Profiles specifically include the control and removal of such alien and invasive species as an investment priority. The control of alien and invasive species in KBAs and corridors is not an exception, but a standard part of CEPF operations in some hotspots, and as such, applicable guidelines must be followed.

Situations where these guidelines apply include grants which:

- Pay for the direct purchase or expenses related to the manufacture, acquisition, transport, application, storage, or disposal of pesticides, including the costs of materials, equipment, and labor.
- Pay for the direct purchase or expenses related to the control or removal of animals by chemical means.
- Pay for the planning, management, or supervision of work which involves the general use of pesticides or animal control as described in the two points above.

Examples of the types of grants to which these guidelines apply include, but are not limited to:

- A grant that involves the employ of labor and application of herbicide to restore a degraded landscape and allow endemic vegetation and animals to return.
- A grant that involves the supervision of teams conducting AIS control by chemical means, where those teams are operating with funding from a host country government or other donor.
- A grant that involves the eradication by chemical means of non-native rats, cats, reptiles (e.g., Brown Tree Snake), birds (e.g., Common Myna), and invertebrates (e.g., Golden Apple Snail) from an island or isolated natural habitat.

These guidelines do **not** apply to the physical removal of alien and invasive plant and animals through physical means as part of the restoration of degraded habitat or the maintenance of KBAs and corridors.

A single set of guidelines cannot anticipate every scenario under which a grantee will propose to remove alien and invasive species. The conditions of the habitat, the type of species, the method of control, the capacity of the organization, the latest knowledge of environmental impacts, and even the definitions of “best practice” will change over time. Thus, these guidelines establish a process that grantees must follow, rather than a specific set of AIS control measures.

Components of the PMP

Any CEPF project that proposes to use a pesticide must prepare a pest management plan with six sections, outlined below. These projects should benefit from the accumulated knowledge on the use of pesticides in invasive eradication, including those that are available at:

- The IUCN Invasive Species Specialist Group (<http://www.issg.org/index.html>), which provides dozens of resources, including the Global Invasive Species Information Network List of Invasive Alien Species Online Information Systems (<http://www.gisnetwork.org/Documents/draftiasdbs.pdf>).
- For Polynesia-Micronesia Hotspot, the Pacific Invasives Initiative Resource Kit for Rodent and Cat Eradication (<http://www.pacificinvasivesinitiative.org/rk/index.html>), which contains multiple templates and guidelines on animal control in the region.
- For Maputland-Pondoland-Albany Hotspot, in particular in South Africa, the Expanded Public Works Programme Working for Water, managed by the Department of Water Affairs (<http://www.dwaf.gov.za/wfw/>), including the Position Paper on Biocontrol (<http://www.dwaf.gov.za/wfw/Control/docs/article1.2.pdf>), the Project Operating Standards (<http://www.dwaf.gov.za/wfw/Control/docs/ProjectOperatingStandards%28May%202007%29Version3.pdf>), and the treatment tables for aquatic and terrestrial invasives, available at the same website.
- The World Health Organization's Recommended Classification of Pesticides by Hazard, updated every two years (http://www.who.int/ipcs/publications/pesticides_hazard/en/).

The pest management plan consists of six sections comprising 34 questions.

Grant Summary

1. Grantee organization:
Fauna & Flora International
2. Grant title:
Islands Without Aliens: Building Regional Civil Capacity to Eradicate Alien Invasive Species
3. GEM number:
60908
4. Grant amount (US dollars):
\$ 116,725 requested
5. Active dates of grant:
July 1, 2012 – June 30, 2014 (requested)
6. Countries or territories where pesticides will be applied:
Antigua & Barbuda and Saint Lucia (Lesser Antilles, Eastern Caribbean).
This plan applies to Saint Lucia only. For Antigua & Barbuda, see Pest Management Plan submitted by the Environmental Awareness Group (GEM #60933)

7. Full name, title, telephone numbers, and electronic mail address of Grantee personnel responsible for the Pest Management Plan:
Dr Jenny Daltry, Project Manager (and Senior Conservation Biologist, Fauna & Flora International),
Tel + 33 6 32 32 32 48/ +1 758 723 7244;
Email jenny.daltry@fauna-flora.org

8. Summary of the project:

This two-year regional project focuses on enabling civil society organizations to successfully eliminate alien invasive vertebrates, including Eurasian rats (*Rattus* spp.), known to be among the greatest threats to island flora and fauna in the Lesser Antilles. The project objectives are: Objective 1 – Civil society organizations learn key principles and methods of eradicating invasive alien species, preventing invasions, and monitoring impacts; Objective 2 – Invasive alien mammal eradication actions designed and implemented in Saint Lucia; Objective 3 – Biosecurity and biodiversity monitoring programmes on Saint Lucia’s offshore islands designed through a sub-grant to Durrell; Objective 4 – Field officers in Saint Lucia implement biosecurity programme on offshore islands through a sub-grant to the Saint Lucia National Trust; Objective 5 – Invasive alien mammal eradication and biosecurity actions designed and implemented in Antigua and Barbuda; Objective 6 – Project complies with CEPF-approved pest management plan; Objective 7 – Methods, impacts and lessons learned from this project are disseminated region-wide to encourage and inform invasive alien species control. The immediate, short-term impacts will include: Impact 1 – At least 25 nationals, representing two local CSOs in the pilot countries and local communities, gain advanced skills in practical invasive species management techniques, including all key steps and tools to plan and implement mammal eradications, evaluate project impact, and prevent reinvasions. Impact 2 – Both of the leading CSOs in the pilot countries, plus other organisations across the region, gain access to tools, partners and expert advisers to enable them to work together to address rodents, goats and other harmful invasive alien species more effectively. Impact 3 – The number of islands being actively and demonstrably kept invasive alien mammal-free within KBAs in the pilot countries is increased by 27% from 11 to 14, and new or improved monitoring systems established on all 14 islands. Impact 4 – The land area of islands being actively and demonstrably kept invasive alien mammal-free within KBAs in the pilot countries is increased by at least 9% (from 78.1 hectares to 85.4 hectares) and likely by more than 20% (i.e. from 78.1 hectares to 94.3 hectares). Impact 5 – Monitoring mechanisms established in all pilot countries to track the social and biodiversity impacts of this project and serve as a baseline for monitoring other threats or conservation actions within the KBAs. Impact 6 – Evidence of increases in wildlife populations on project islands by project end include at least 10% increase in key species for which baseline population data are available for 2011, including the Antiguan racer (CR) and Endangered lizards in Saint Lucia. Impact 7 – At least \$100,000 leveraged by the end of the grant period to support recurrent management and monitoring costs of Antigua’s and Saint Lucia’s offshore islands for at least two more years.

The use of pesticide - specifically the rodenticide brodifacoum - is key to the success of this innovative regional project. Further details of why it has been selected and how it will be applied are presented below.

9. Date of plan:
12 May 2012. (Earlier versions were submitted on 20 February 2012 and 4 May 2012)

Pest Management Approach

10. Current and anticipated pest problems relevant to the project.

Alien invasive rats, including the black rat (*Rattus rattus*) and brown rat (*R. norvegicus*) have colonized almost every vegetated island in the Caribbean, including remote offshore cays and are rated as two of the world's worst invasive species by the IUCN/SSC. These omnivorous and highly adaptable rodents have diverse negative impacts on native biodiversity through predation, competition and habitat degradation (Townsend et al. 2006, Jones et al. 2008). These rats are major predators of land and seabirds, invertebrates, lizards and native mammals, and are voracious consumers of vegetation, seeds and fruit and have caused the extinction of a number of plant species, particularly those on isolated offshore islands (Atkinson 1985, Bell 1978, Imber 1985, King 1990).

The true extent of their impacts in the Caribbean is perhaps best seen when they are removed: The eradication of rats by FFI and our partners from 13 islands in Antigua's Offshore Islands KBA, for example, resulted in a 10-fold rise in the total population of Critically Endangered Antiguan racer snakes (*Alsophis antiguae*), 4-fold increase in red-billed tropic birds (*Phaethon aethereus*), 10-fold increase in brown pelicans (*Pelecanus occidentalis*) and 16-fold increase in near-threatened white-crowned pigeons (*Patagioenas leucocephala*) within 15 years. Native plant biomass on the same islands has also increased by at least 25%. A comparative study in 2010 and 2011 found a significantly higher density and diversity of birds, and three times the density of endemic lizards, on rat-free islands than on neighboring rat-infested islands. Rats can be successfully eliminated from even large islands, but the problem of reinvasion must also be addressed, because rats are adept at swimming between islands (albeit rarely further than 1km) and can be easily carried on boats from rat-infested ports.

If this project does *not* take place, there is a greater risk of the existing rat-free islands in Antigua and Saint Lucia becoming reinvaded and local groups being unable to eliminate the rats unaided. There will also be the missed opportunity to eradicate rats from additional islands in the pilot countries, where native biodiversity is being heavily suppressed by rats.

11. Current and proposed pest management practices (Saint Lucia).

Current practices

Rats have been eradicated from a number of islands in Saint Lucia since 1994, and the focus of current practices on these islands are on basic **biosecurity** only i.e. preventing rats from reinvading these islands.

The main preventative methods currently in place comprise permanent bait stations (established on 3 islands in Saint Lucia). These are plastic bait boxes, raised on short pedestals, which contain up to 160g Klerat™ or Talon™ (brodifacoum-based bait produced by Syngenta). The bait stations are visited several times per year (the current target in Saint Lucia is every 5-6 weeks) and bait checked for any signs of rats. In the rare event that rat signs are detected, additional bait is manually distributed in the affected part of the island until no further signs of rat activity are observed. This system is currently managed by Durrell and Saint Lucia Forestry Department personnel in Saint Lucia.

Proposed practices - Biosecurity

FFI will work closely with local partner CSO (Saint Lucia National Trust) and international partner CSOs (notably Durrell Wildlife Conservation Trust) and communities to establish additional biosecurity measures to further strengthen the protection of all of the rat-cleared islands in Saint Lucia. By the project end, improved biosecurity measures will be in place on four islands in Saint Lucia (Maria Major and Maria Minor in Point Sable KBA, Dennery and Praslin in Mandele Dry Forest KBA). We will work together to bring all of the target KBAs up to a high standard in terms of permanent bait station design and maintenance (above), as well as introducing a variety of additional innovative, practical rat detection techniques that do not require rodenticide ('rat hotels', tracking tunnels, chocolate wax, chew cards, etc.). In addition, this project will strengthen the direct involvement of local communities in rat control in Saint Lucia, teach boat owners why and how to keep their vessels rat-free, and significantly raise awareness nationally and regionally of why and how to control the spread of rats. Extension materials will be distributed regionally to further raise awareness and inspire CSOs in other countries to develop their own invasive species control programs.

Proposed practices - Eradication

No rat eradications are scheduled to take place in Saint Lucia during the CEPF grant period because all of the main islands in the eligible KBAs are currently believed to be rat-free (rats have not been found on the Maria Islands, Dennery was cleared of rats in foreign experts in 2008 and Praslin was cleared of rats in 1994 (and repeated in 2000 and 2009, following reinvasions). However, Saint Lucia National Trust personnel will be taught how to carry out an eradication and *if, during the CEPF grant period, rodents are found to have invaded any of the aforementioned KBA islands, they must be eradicated*. This project will also develop a feasibility plan for eradicating rats from a mainland site in Saint Lucia (although actual implementation would not begin until after the CEPF project ends).

In all rat eradication operations, rodenticide in the form of Klerat™ will be distributed by hand at an average total dose rate of 9.5 kg/ha. Bait will be replaced every day for up to 21 days or until uptake by rats has ceased to ensure the complete eradication of all rats. The bait will be distributed every 30-40 meters across the island, in a perfect grid formation: the exact specific dimensions and frequency will be finalized in the Operational Plans for the rat eradications in question (e.g. if alien house mice *Mus musculus* are also detected on the islands, the grid size will be reduced to not more than 25x25 m to eradicate them at the same time). If the island is densely vegetated, narrow trails will be cut to reach all parts of the island. Every bait site ('station') will then be individually numbered, have its position recorded using GPS and added into a GIS-linked database. Maps will be produced of the bait station grid for all phases of the operation. Any gaps in the grid can be detected and corrected prior to the poisoning phase. It is important that bait stations are also placed on any neighboring cays that have vegetation, plus any cliffs and caves.

Bait uptake by the rats and any non-target animals will be closely monitored (see below). Any uneaten bait (a very small quantity, if indeed any) will be collected and disposed of in landfill sites in accordance with the manufacturer's safety guidelines. All landfill waste is automatically incinerated in Saint Lucia before being buried so no toxic residue will remain by this stage. During the final stages of the bait being deployed, and for several weeks afterwards, the island will be closely monitored for any signs of surviving rats by using a combination of detection techniques (e.g.

chocolate wax, tracking tunnels, chew cards, etc). If any surviving rats are detected, additional rodenticide will be deployed and monitored as before.

12. Relevant integrated pest management experience within the project area, country or region.

Within the Caribbean Hotspot, FFI has been the leading instigator and implementer of rat eradication programs in Antigua since 1995 (including eradicating black rats from 13 islands in Antigua's Offshore Islands KBA) and the Bahamas in 1998 (Sandy Cay). In April 2012, we eradicated rats from three islands in Anguilla (including the 207-hectare Dog Island, which will become the largest Caribbean island to be cleared of rats). The Project Manager of the proposed CEPF project was personally involved in managing or implementing 15 of the aforementioned eradications, and, together with a rat eradication expert Karen Varnham, co-designed the permanent bait station monitoring systems that are currently in place on Antigua and Saint Lucia and are now under the day to day management of local organizations.

In Saint Lucia, Durrell Wildlife Conservation Trust has led the eradications (and in two cases, re-eradication) of rats from three offshore islands since 1994 (including Praslin Island in Mandele Dry Forest KBA, for which FFI's Jenny Daltry was hired by Durrell to lead the eradication in 2000) and established permanent bait stations that were modeled on the pilot biosecurity system in Antigua.

13. Assessment of proposed or current pest management approach and recommendations for adjustment where necessary.

As outlined above, the current management of rats in Saint Lucia is focused on biosecurity, i.e. preventing rats from invading or reinvading islands of outstanding importance:

Biosecurity – current approaches and recommendations

The permanent bait stations appear to have played an important role in keeping most of the target islands rat-free, but the biosecurity system has several flaws and weaknesses:

- Older versions of the bait stations tend to degrade and fall apart within two years. The Project Manager recently tested a new design on Anguilla that has removed all rust-prone parts, is easier to install, and can be expected to last at least 10 years. The new model should be used to replace all previous versions on Saint Lucia over the next few years.
- Personnel responsible for bait station management often become complacent that the bait stations will kill all invading rats, when in fact their main purpose is the early detection of an invasion. Any signs of rats should immediately trigger additional steps to eliminate any other rats in the affected area.
- Personnel responsible for maintaining the current biosecurity system are unaware of or do not have access to other, simple methods of detecting rat presence.
- The bait stations use rather relatively large quantities of rodenticide, with crabs and ants frequently finding and eating the bait. The bait is harmless to these invertebrates and no negative impacts on any wildlife have been detected, but nonetheless we wish to reduce the wastage of bait. While the rodenticide should not be removed from the bait stations completely, FFI proposes to substitute at least half of this amount with other non-toxic substances designed to detect rat presence.

- Saint Lucia currently does not maintain sufficient quantities of rodenticide in their storage facilities for emergency responses to rat invasions. This is a concern because unless a rat invasion is treated swiftly, the new population will very rapidly increase and spread, resulting in the need for another complete island eradication.
- In Saint Lucia, all rodenticide is currently bought using conservation funding, and it is uncertain how this supply will be funded after 2014. However, FFI will negotiate a permanent free supply of the same brand of bait using our connections with the manufacturer. This will be a major contribution to the long term sustainability of the rat control program.

All of the above problems will be addressed by this present project.

Eradications – current approaches and recommendations

No eradication operations are currently underway in Saint Lucia or scheduled to take place during the CEPF grant period. However, the following methods will be taught to the Saint Lucia National Trust and may be applied if and when any rats are discovered to have reinvaded the Maria Islands, Praslin or Dennery Island..

Methods for eradicating rats have been well tested and refined, as some 20 rat eradications have been completed in this region, all fully successfully and with zero mortalities of non-target species. In most cases, including all previous cases in Saint Lucia, the eradication entails the manual distribution of a brodifacoum-based bait at least every 40 meters across the island (50 meters being the distance travelled by black rats during normal foraging routines). On densely vegetated islands, paths to the bait locations must first be cut. Bait is typically distributed for 3 weeks, with intensive monitoring during and after to determine that all signs of rat activity cease, and to detect any unexpected problems such as non-target animals interfering with bait. All uneaten bait and any rat carcasses are collected and incinerated (although the majority of rats die underground). Generally the best time to target a pest population is when individuals are under stress. For rats in the Caribbean, this is normally at the end of the dry season when the population will have peaked and desperate for food as the natural food supply dwindles. As a result rats are more likely to accept a new food source (i.e., the bait), making baiting more effective.

The methods that will be used by the present project will be largely unchanged from this model because it has proved so successful on similar Caribbean islands. However, all past rat eradications have relied very heavily on foreign expertise and labour (including the Project Manager of the present project) to design and implement the eradication plans (the majority and, in some cases all, of the fieldworkers have been foreigners). Of the nationals who have taken at least some part in rat eradications, most no longer work in this region.

This shortage of local, national capacity to conduct rat eradications from start to end is of concern for two main reasons:-

- Personnel who are involved in eradicating rats from islands often gain a great sense of pride and ownership in the islands, which can lead to them becoming actively involved in follow-up restoration and conservation activities after the foreigners have left.

- Employing foreign experts to design and lead rat eradications can sometimes prove more expensive, especially as their costs also include airfares and accommodation, and their appointment may take longer to arrange (this is of particular concern in an emergency situation where rats have reinvaded a high priority island).

This project will therefore also make a very concerted effort to build local capacity to lead and implement all stages of a rat eradication operation through providing training and mentoring local CSO staff throughout all steps of eradicating rats. The technical knowledge and skills are in fact not very difficult or costly to learn and apply and, by the time this project ends, we believe there will be sufficient capacity in Saint Lucia to eradicate rats from small islands without foreign support. Nevertheless, our trainers will recommend all rat eradication plans are subjected to international peer-review, in line with best practice, and local groups should never hesitate to seek the trainers or other experts if they encounter unexpected problems.

Pesticide Selection and Use

14. Description of present, proposed and/or envisaged pesticide use, and assessment of whether such use is in line with best management practices.

The only pesticide to be used in this project is the rodenticide **brodifacoum**, at a concentration of 0.005% in Klerat™. As described above, this will be used for biosecurity (placed in the permanent bait stations to detect and kill invading rats) and, if rats reinvade any of the four target islands, it would also be used for eradication. Note: No personnel will be permitted to handle and deploy rodenticide until they have been trained to do so. At no time will bait be accessible to the general public.

Biosecurity

Brodifacoum, in the form of waxy blocks (Klerat™), is currently in use in the locked permanent bait stations on Saint Lucia, where it serves a dual purpose of killing invading rats and indicating their presence (rats leave visible teeth marks on the waxy surface of the bait). This will continue to be used for biosecurity by this project, although we hope to reduce the quantity of rodenticide used by replacing approximately half of the current quantity with other non-toxic monitoring materials.

Brodifacoum is a second-generation anticoagulant poison that acts by reducing the animal's ability to coagulate blood (i.e. inhibits the synthesis of Vitamin K₁ and as a result rats die of internal hemorrhaging, Eason & Wickstrom 2001). Death usually occurs between three and ten days after consumption of a lethal dose. For a 250 g black rat, the LD50 for brodifacoum is less than 5 g of bait which can be obtained in a single feed. As a result bait shyness is avoided. More information on this rodenticide is given below.

Other second generation poisons (e.g. bromadiolone and difenacoum) and even first generation poisons (e.g. diphacinone) have also been used successfully in eradications around the world (Bell et al. 2000, Bell 2004, Howald et al. 2007, Witmer et al. 2007, Bell et al. 2008). However, as these poisons require rats to eat much larger amounts of bait (c. 18 g for difenacoum or c. 12 g for bromadiolone) or require multiple feeds regularly over several days to obtain a lethal dose (3 mg/kg over 5 days for diphacinone), they are less suitable for tropical islands when rats need to be targeted quickly and when other natural food options are still available.

Eradication

Rodenticide remains the only effective means of completely eradicating rats from an area, and the methods used by this project have passed previous close inspections by, among others, the IUCN/SSC Invasive Species Specialist Group, Island Eradication Advisory Group and Royal Society for the Protection of Birds. Using rodenticide, rodents have been successfully removed from islands ranging in size from 1 to 11,200 ha throughout the world (Towns & Broome 2003, Howald et al. 2007). Most of these have been conducted in New Zealand where the technique was first developed. Poisoning methods range from ground based (bait station or hand spreading) to aerial broadcasting operations (in some cases a combination of methods is used). The method of poison application depends on the physical and ecological (specifically the risk to non-target species) characteristics of the island in question and the number of rodent species being targeted. However, this project will use only ground-based methods.

In line with best practice, all planned eradications will first require (a) a **Feasibility Study**, including detailed risk assessment and analysis of the options in consultation with local stakeholders, following international guidelines; and (b) A written **Operational Plan**, which details the methods, equipment, transport, personnel, training, logistics, timetable, etc., and discussed with local stakeholders and peer-reviewed by independent experts. All eradications also require (c) **Biosecurity Program** and (d) **Monitoring and Evaluation Program**, which will continue after the eradication is completed. Careful planning and close monitoring of the pesticide's use and effects both during and after the eradication will ensure risks to non-target species are minimized, if not removed entirely.

In the unlikely event that any rat eradications are carried out in Saint Lucia during the grant period, the bait will be distributed at a rate of approximately 9.5 kg/ha. This is based on the estimated that bait will be replaced every day (for up to 21 days or until bait take has ceased) to ensure the eradication of all rats. On most islands it is recommended that the bait stations be established on a 30 x 30 m grid or 30 x 40 m grid, but this will be finalized in the Operational Plan based on such factors as the density of rats and the terrain. It is important that bait stations are also placed on offshore cays which have vegetation, stacks that are connected to the target island, cliffs and caves. Every bait station will be individually numbered, have its position recorded using GPS and be added into a GIS-linked database. Maps will be produced of the bait station grid for all phases of the operation. Any gaps in the grid can be detected and corrected prior to the poisoning phase.

15. Indication of type and quantity of pesticides envisaged to be financed by the project (in volume and dollar value) and/or assessment of increase in pesticide use resulting from the project.

No CEPF funds will be used to *purchase* pesticide, but CEPF funds will be used to support operational costs to transport and deploy rodenticide for biosecurity purposes and, if necessary, eradication. An estimated 94kg of the rodenticide (worth \$2,350) will be deployed in Saint Lucia during the CEPF project, all donated by the manufacturer, plus approximately 400kg put into storage on Saint Lucia for contingency and long term biosecurity.

16. Chemical, trade, and common name of pesticide to be used.

Brodifacoum (Bromfenacoum), $C_{31}H_{23}BrO_3$. The trade name of the bait used in this project is Klerat™, which contains 0.005% brodifacoum, but the same rodenticide is the active ingredient in

Biosnap™, d-Con™, Finale™, Fologorat™, Havoc™, Jaguar™, Matikus™, Mouser™, Pestanal™, Pestoff™, Ratak+™, Rodend™, Ratsak™, Talon™, Volak™, Vertox™ and Valid™.

17. Form in which pesticide will be used (e.g., pellet, spray).

The brodifacoum is provided at 0.005% concentration in 20-g blocks or briquettes. Based on our experience, success in other eradication operations in the Tropics, and preference trials we have conducted with rats and non-target species in the Caribbean, we proposed to use Klerat™ both for eradication and biosecurity purposes. We prefer not to use pellets because these are harder to monitor and may be more likely to be eaten by lizards and birds.

18. Specific geographic description of where the pesticide will be applied: name of province, district, municipality, land owners, or map coordinates (if available); and the total area (hectares) to which the pesticide will be applied.

This pesticide will be used as part of biosecurity measures on Maria Minor and Maria Major* (12.1 hectares) in Point Sable KBA, Dennery Island (1.6 ha) and Praslin* (1.1 ha) in Mandele Dry Forest KBA = 14.9 hectares. All of these are vested in the Saint Lucia National Trust, apart from Praslin (privately owned).

Though small, these islands contain a disproportionately high percentage of Saint Lucia's rare and endemic species (see proposal). Many globally threatened species survive *only* on these islands, including the Endangered Saint Lucia racer (currently being upgraded to Critically Endangered) and Endangered Saint Lucia whiptail lizard.

19. Assessment of environmental, occupational, and public health risks associated with the transport, storage, handling, and use of the proposed products under local circumstances, and the disposal of empty containers.

Brodifacoum is highly toxic and a potential risk to humans and other mammals and birds, but is completely harmless to invertebrates and a low risk to most reptiles. The median lethal dose (LD50, i.e. 50% of test subjects will die from level of poison ingestion) of pure brodifacoum for several species is as follows: Rat 0.27 mg/kg; Mouse 0.4 mg/kg; Dog 0.25-3.5 mg/kg; Cat 0.25-25 mg/kg; Rabbit 0.2 mg/kg; Pig 0.1 mg/kg; Sheep/Goat 5-25 mg/kg; Gull 0.75-5 mg/kg; Duck 4.6 mg/kg. Reptile LD50s have not been documented, but experimental studies indicate a high resistance (e.g. snakes exhibited no ill effects from being fed on rats poisoned with similar anticoagulant rodenticides). This toxin is cumulative and can persist in the liver and other internal organs for several months.

Importantly, to minimize the risk of it being eaten by humans or non-target animals, the bait is designed to be unattractive, even repellant to any vertebrates other than rats. The brodifacoum is provided by the manufacturer in waxy blue blocks impregnated with Bitrex™, which are not only technically difficult for most native animals to peck or bite, but taste extremely bitter and waxy. The bait is dyed blue (by the manufacturer) to ensure birds and other animals do not even notice it or recognise it as food.

Furthermore, the concentration of brodifacoum in the bait is only 0.005% (an adult human would therefore need to eat 300 grams, or 15 blocks, for a potentially fatal dose, which is far too much to ingest by accident). In our 17 years' experience of using this bait in the Lesser Antilles, our team has never observed any native birds, reptiles or other vertebrates showing the slightest interest in this bait, even when presented to the animals in crumbs rather than complete blocks. In the few cases where we have eradicated rats from islands with livestock (e.g. York Island, Antigua, in 2006, and Dog Island, Anguilla, in 2012), even goats have ignored this bait.

The bait is transported in waterproof containers with tight-fitting lids (this is particularly important when moving the bait to the islands by boat). Every pail holds 10kg and is clearly labeled in English with details of the contents and a safety sheet (including what to do if any bait is consumed). An example bait label for Klerat™ is available from the following link: http://www.pestcontrol.basf.co.uk/agroportal/pc_uk/media/migrated/products_1/downloads/rodents/labels_1/KLERAT_WAX_BLOCKS_35KG.pdf. The bait is stored in the Saint Lucia Forestry Department headquarters in Union, with only a small circle of individuals (notably the project's National Coordinators) having access.

The permanent bait stations on the offshore islands are locked at all times, to prevent tampering by people or pets, and are securely bolted in place on cement pillars. It is not possible to dismantle these boxes without a key. The stations are cleverly designed to prevent people from reaching the bait (not even a child could reach the bait by inserting a hand inside the rat entry holes, because the bait is held behind a partition wall). Furthermore, every block of bait is also embossed with a skull and crossbones, as an unmistakable warning to people that it is toxic.

No rat eradications are planned to take place in Saint Lucia during the grant period, but, in the unlikely even this is necessary (i.e. if rats reinvade any of the project islands), announcements will be made on radio and local papers before additional bait is deployed and warning signs will be placed around all entry points on the island, similar to the example below:-



Warning sign prepared by Fauna & Flora International for Dog Island Restoration Project, Anguilla, February-April 2012. Every block of bait used in the present project is individually embossed with a skull and crossbones.

The antidote for brodifacoum is Vitamin K₁, which is available as injections or tablets from any veterinary clinic or hospital. An adequate supply of Vitamin K₁ will be purchased for all project sites in case of emergency. The poison is rather slow-acting, which gives ample time (days) for a person to seek medical attention.

In the field, any brodifacoum dropped or defecated by animals binds to soil. The probability of any brodifacoum leaching into the surrounding sea is very small and the quantities involved are too minute to have any effect on fish or other marine life (the concentration of brodifacoum in the bait is only 0.005%).

The bait removed from the containers leaves almost no residue (<1 gram), and these containers are easily washed out using plenty of water. Any waste bait, include bait that is past its sell-by date, will be incinerated and buried in secure landfill sites in accordance with the manufacturer's guidelines. The United Nations Environmental Program and World Health Organisation endorse this approach (<http://www.inchem.org/documents/hsg/hsg/hsg093.htm#SectionNumber:4.6>). "Burn or bury any uneaten bait. Do not dump it in water. Look for dead rats and mice and burn or bury them." Brodifacoum is fully combustible and fumes from incineration are harmless at the very low concentration and quantity involved in this project.

20. Description of plans and results for tracking of damage to and/or deaths of non-target species prior to pesticide application and subsequent to pesticide application.

Not even one non-target death of a bird, reptile or any other native animals has been observed in all previous rat eradication and biosecurity projects in this region using the same or similar methods. That is in spite of intensive monitoring on the ground, which we expect to continue to be a feature of the CEPF project. For example:-

Biosecurity

All permanent bait stations are visited at least once every 5-6 weeks, during which time any dead or sick non-target animals will be reported and any fresh carcasses examined for evidence of internal bleeding. In addition, key wildlife species are monitored at least once a year (Deliverable 5.5), partly as a means of measuring trends after rats have been eliminated. Although no suspicious decreases have been recorded to date, these monitoring data will help to indicate any problems that may be linked to the biosecurity program.

Rat eradications

If the Maria Islands, Praslin or Dennery are reinvaded by rodents during the grant period, the rats would be eradicated by the project team. Using FFI's ground-based methods for eradicating rats, personnel will remain on the island both during the deployment of bait (typically 21 days) and for several weeks after the rats have been killed, and monitor all parts of the island at least once a day throughout. Any dead or sick non-target animals will therefore be detected promptly and carcasses examined for evidence of internal bleeding and for the presence of blue wax in the alimentary canal that would indicate they have consumed the bait.

In both cases, if any non-target species are found or suspected to be suffering from the pesticide, the National Coordinator must be notified immediately and the project team will halt operations

until a suitable mitigation measure has been identified. This is a conservation project and it is not our intention to endanger anything other than the alien mammals.

21. Pre-requisites and/or measures required to reduce specific risks associated with envisaged pesticide use under the project (e.g., protective gear, training, upgrading of storage facilities, etc.).

All personnel involved in the storage, transport and deployment of the rodenticide will be trained by the project leaders (Component 1). No personnel will be permitted to handle and deploy rodenticide until they have been trained to do so. At no time will bait be accessible to the general public.

No specialist equipment is required, but personnel are advised to wear gloves (which will be provided) when handling bait. Bare hands may be used because the rodenticide cannot be absorbed through skin, but it is important to wash hands afterwards to avoid accidentally transferring the bait to the mouth.

All facilities used to hold bait should be locked, and access to keys restricted to only a few individuals directly involved in this project. The storerooms do not need to be refrigerated, but the bait should not be exposed to unduly high temperatures, as it will gradually degrade and may even melt. Suitable storage facilities have already been identified and are in use on Saint Lucia (a locked storeroom inside the headquarters of the Saint Lucia Forestry Department).

22. Basis of selection of pesticides authorized for procurement under the project, taking into consideration WHO and World Bank standards, the above hazards and risks, and availability of newer and less hazardous products and techniques (e.g. bio-pesticides, traps).

There are no bio-pesticides, traps or other measures sufficiently powerful to completely eradicate rats from an island – at best, they are merely a temporary means of reducing the population size. Rats are naturally very wary of any new objects or foods in their environment, especially when they detect other rats becoming trapped or dying. Anticoagulant rodenticides have the advantage of having a relatively slow action, which usually means that the entire rat population has consumed a fatal dose before the first individuals start to die. Their delayed action also means that if a human or non-target animal were to consume the rodenticide, there is ample time to seek treatment (Vitamin K₁).

The project team has considered a variety of options, including coumatetralyl, diphacinon, pindone, warfarin, bromadiolone, flocoumafen and difenacoum. Brodifacoum remains the rodenticide of choice because:

- Very potent to rodents – a single feed is fatal
- Delayed onset of symptoms (which prevents neophobia and bait shyness as noted above)
- Insoluble in water (does not wash away in rain)
- Widely used in eradications (including proven track record in Caribbean) and has the highest rate of success of any known method
- Efficacy data are widely available
- Non-target impact data are widely available
- Range of bait formulations available (rats can be choosy)

- Antidote is readily available – Vitamin K₁
- It is already widely available in the Caribbean, should anyone wish to replicate this project (see under Replicability section in the project proposal).

Brodifacoum has been used successfully in over 70% of the eradications completed worldwide and on most of the eradications within the Caribbean region (Howald et al. 2007, Varnham 2010). Although some of the other second-generation anticoagulants share many of these same advantages and could potentially work as well, none have any additional advantages over brodifacoum.

As noted above, no CEPF funds will be used to buy rodenticide. This will be provided as in-kind support from the manufacturer.

23. Name and address of source of selected pesticides.

(Manufacturer headquarters) Syngenta International AG P.O. Box CH-4002 Basel, Switzerland.

The rodenticide is actually produced in Hungary and from there flown or shipped by the manufacturer to the Caribbean. The mode and cost of transport is the responsibility of the manufacturer.

24. Name and address of vendor of selected pesticides.

N/A. Obtained directly from manufacturer.

25. Name and address of facility where pesticides will be stored.

SAINT LUCIA: Saint Lucia Forestry Department, Ministry of Agriculture, 5th Floor, Block A NIS Building, Waterfront, Castries, Saint Lucia. (The locked storeroom is inside the climate-controlled herbarium in the Forestry Department headquarters in Union).

Policy, Regulatory Framework, and Institutional Capacity

26. Policies on plant/animal protection, integrated pest management, and humane treatment of animals.

Brodifacoum is harmless to plants, micro-organisms and invertebrates. This project complies with all existing legislation that refers to animal protection and treatment of animals in Saint Lucia:

Saint Lucia

- The Animals Act (2003) addresses animal cruelty, including prohibiting poisoning of animals, but does not apply to rats and other small vermin.

- The Wildlife Protection Act (1980) classifies all rats and mice as ‘unprotected wildlife’. No protected species will be harmed by this project.

The brodifacoum bait used in this project is available off-the-shelf in most hardware stores and is widely used by local farmers and homeowners.

All field work by FFI adheres to the detailed ethical code set out by *Oryx – The International Journal of Conservation*, which governs ethical treatment of local people and other stakeholders, as well as treatment of animals. The use of an anticoagulant rodenticide is admittedly not very humane from the rats’ perspective (PSD 1997), but unfortunately there is no genuinely humane alternative that is as effective in wiping out entire rat populations. Its use has to be weighed against the lack of alternatives and the ultimate outcome of restoring and conserving native biodiversity.

The planned project will also abide by the Vertebrate Control Policy established by the Royal Society for the Protection of Birds, which is applied to vertebrate control in the UK and UK Overseas Territories. In order to satisfy the policy, four tests must be passed: (i) that the seriousness of the problem has been established, (ii) that non-lethal measures have been assessed and found not practicable, (iii) that killing is an effective way of addressing the problem, and (iv) that killing will not have an adverse impact on the conservation status of other non-target species. These tests have been met by all previous FFI-led rat eradication operation in the Caribbean and will be applied to the proposed project activities.

This project has also been assessed using the ethical principles of Humane Vertebrate Pest Control (developed by RSPCA Australia, Humane Vertebrate Pest Control Working Group 2004) and will satisfy all criteria:

- The aims, benefits and harms of the eradication operation have all been clearly established, and efforts are ongoing to maximize the benefits and minimize the harms, thereby strengthening the ethical justification (Principle 1);
- The eradication operation is technically feasible and likely to succeed (Principle 2);
- The proposed rodenticide to be used, brodifacoum, is the most humane method that will achieve the aims of the eradication operation with a high likelihood of success, having already been used in many successful island operations (Principle 3);
- Methods which are proven to be effective on similar islands will be used (Principle 4);
- Established best-practice removal techniques will be followed wherever practical, and the project has been externally reviewed by the world-leading experts (such as Island Eradication Advisory Group, IEAG) (Principle 5);
- Monitoring will take place two years after the operation in order to assess whether the precise aim has been achieved (Principle 6);
- A wide-range of biosecurity measures are being progressed to ensure that the islands remain rodent-free after the operation and that no further control therefore needs to be undertaken (Principle 7);
- On the balance of factors, the method chosen is the only one which is likely to succeed on this island (Principle 8).

27. Description and assessment of capacity to develop and implement ecologically-based invasive and alien species control mechanisms.

As explained under 13, current capacity within Saint Lucia is limited, with almost no persons with the necessary know-how and experience to lead a rat eradication from start to finish. Building capacity among the relevant CSOs, by means of training, mentoring and provision of equipment and other resources to 'learn by doing', is a primary objective of this project.

Please see project proposal for more details. Some of the key deliverables under Component 1 ("Civil society organizations learn the key principles and methods of eradicating alien invasive species and preventing reinvasion") include:-

- 1.1. CSO baseline existing capacity and training needs evaluated at start and end of project. Capacity of Saint Lucia National Trust and EAG is shown to have been strengthened by this project, based on the CEPF Civil Society Tracking Tool.
- 1.2. At least 15 nationals trained on invasive alien species control to the level where they can implement the biosecurity and eradication activities under Components 2 and 5. Workshop and trainer reports detail the names of trainees, subjects covered, progress made and key observations and conclusions.
- 1.3. At least 10 nationals trained to the level where they can implement biodiversity monitoring activities. Workshop and trainer reports detail the names of trainees, subjects covered, progress made and key observations and conclusions.

Beside formal training, CSO staff, members and volunteers will also learn-by-doing and benefit from ongoing mentoring from experienced alien invasive species experts and ecologists.

28. Description and assessment of the country's regulatory framework and institutional capacity for control of the distribution and use of pesticides.

This project complies with all existing legislation that refers to toxins, limited though this is:

Saint Lucia

- The Biosafety Act (2006) governs only the management of genetically modified organisms.
- The Pesticides Control Act (1975) empowers the Minister to make regulations on the use of certain pesticides and allows inspectors to examine the use of pesticides. However no regulations have been issued that apply to brodifacoum.

To reiterate, the brodifacoum bait used in this project (Klerat™) is available off-the-shelf in most hardware stores in Saint Lucia and is widely used by local farmers and homeowners. The fact that our imports of Klerat™ are facilitated by the Government (the Saint Lucia Forestry Department in Saint Lucia) further demonstrates that its use does not conflict with government policy.

The only significant restrictions we have encountered concern dropping bait by helicopter, which requires prior approval from the relevant Aviation Authority to ensure that the helicopter is not overloaded and still able to fly safely. However, the present project will use only manual ground-based methods.

Saint Lucia is currently developing a national alien invasive species management strategy, which is expected to lead to further policies and regulations (mainly regarding the importation of exotic species rather than control of established aliens), and a regional strategy is also being developed by the CABI as part of their regional UNEP/GEF project.

Institutional capacity is woefully limited across both civil society and government, and is greatly constrained by low numbers of technical staff and limited funding. However, Saint Lucia recognizes its need and responsibility to control alien invasive species and has signed up to relevant international agreements including the Convention on Biological Diversity and St George's Declaration. The government-endorsed management plans for the Point Sable Environmental Protected Area (including the Maria Islands) also specifically identifies the need for effective rat control on the offshore islands, and highlights the particular management roles and responsibilities of the Saint Lucia National Trust.

29. Proposed project activities to train personnel and strengthen capacity (list # of people and what they are being trained in).

All aspects of this project are designed to build and strengthen local capacity to address alien invasive species within a natural ecosystem. A full training needs analysis will be conducted in each country at the beginning of the project to determine exactly the numbers of persons and topics to be covered. We anticipate most training classes or workshops will have 6-10 trainees.

Although the project will involve a minimum of 10 Saint Lucian trainees in planning and implementing two rat eradication operations, a core principle of the training program is that 'prevention is always better than cure'. Local conservationists will learn, if they have not already done so, that it is far cheaper, easier and safer to prevent rodents and other pests from invading than it is to eradicate them.

30. Confirmation that the appropriate authorities were approached (who and when) and that the appropriate licenses and permissions were obtained by the project.

FFI has active Memorandums of Agreements with the relevant authorities which endorse FFI's role in biodiversity management, capacity building and invasive species management:

Saint Lucia

MoA with Saint Lucia National Trust, Saint Lucia Forestry Department and Durrell Wildlife Conservation Trust. Signed August 2011. Most of Saint Lucia's offshore islands concerned are vested in Saint Lucia National Trust, which strongly endorses rat control and biodiversity conservation (since 1994).

In Saint Lucia, our partner the National Trust has the power to approve pesticide use on the offshore islands in its care.

Consultation

31. Plans [for], dates, and results of expert consultations (if necessary).

The project team will also call upon independent experts from the IUCN/SSC Invasive Species Specialist Group and Island Eradication Advisory Group to:-

- a) Peer-review the rat eradication Operational Plans and any changes to the Biosecurity Program protocols: Peer-reviewers will, among other things, be asked to pay particular attention to the choice and use of pesticides, and suggest additional mitigation measures where necessary. The deadlines for these plans are shown on the proposal timetable (e.g. the revised Biosecurity Strategy for Saint Lucia's offshore islands should be completed in 2012).
- b) Peer-review papers, training materials and other outputs from this project, especially those intended for widespread circulation: Some of the deadlines for these outputs are shown on the proposal timetable. (These can be confirmed if and when the project start date is confirmed).
- c) Provide advice to resolve any additional problems encountered during the rat eradications and biosecurity activities: Although we trust no problems will arise that the project team cannot handle, other experts may have encountered similar problems in other countries and could suggest solutions on an ad-hoc basis.

None of the experts will be paid for peer-reviewing or providing ad-hoc advice. Their contribution is reciprocated by the Project Manager and the project's Alien Invasive Species Adviser who are frequently asked to review other project plans and outputs.

32. Plans [for], dates, and results of consultations with affected communities.

Consultations with landowners and other local community members have begun in preparation for the CEPF project, and we view this as an ongoing process, with further meetings with individuals and groups taking place every month.

Although no people live on the target islands, many people – some from the coastal villages - use them for recreation and other purposes. The direct risk to people from the pesticide is almost inconceivably low (even a child would need to eat a very large quantity of bait to suffer ill effects, and the bait tastes disgusting) and also very easily treatable with the antidote Vitamin K₁. Nonetheless we will advise people to keep away from the islands targeted for rat eradication during the 3-4 weeks that bait is present, partly for their own protection and partly to avoid potentially deterring rats from taking the bait.

It is important to note that exactly the same pesticide has been used in all previous rat eradications in Saint Lucia (and other countries) without any problems or objections being raised by local communities, nor indeed any signs of local communities being inconvenienced or harmed by its use. Interestingly, prior to the 2012 rat eradications in Anguilla, local fishermen asked whether bait would leak into the sea and kill fish, but this risk is avoided by using precisely targeted ground-based baiting and relatively low quantities of bait compared to aerial means. The same pesticide is already commonly used in this region and is available from most hardware stores and agricultural suppliers. Nevertheless, any concerns regarding the pesticide or any other aspect of the project will be listened to seriously and properly addressed. In meetings and radio shows, the project team will clearly explain how the pesticide works and exactly how it will be used.

We should add that, as a principle, community members are not paid to take part in consultations because this would set a bad precedent for any future participatory conservation initiatives by local CSOs or other groups. However, the project team may provide refreshments for meetings that run for more than an hour. Most meetings will take place in the local villages.

Monitoring and Evaluation

33. Description of activities related to pest management that require monitoring during implementation.

Biosecurity

The most important monitoring activity in Saint Lucia is to regularly check and maintain permanent bait stations on the rat-free islands. Permanent bait stations should be placed around the islands, especially in areas with optimum rat habitat and in high risk areas, to aid with detecting and intercepting invading rats. Every station must be visited at least once every 5-6 weeks to check whether there are any signs of rats, ensure the stations are in good working order, clear away any overhanging vegetation (that may allow hermit crabs to enter and raid the stations) and to replenish the bait where necessary.

In addition to the bait stations (many of which are already currently in use on Saint Lucia), this project will also introduce and teach additional monitoring tools as appropriate (such as chocolate wax, chew cards, rodent motels).

Eradication

During an eradication operation, the uptake of bait is monitored and evaluated by field personnel visiting all bait deployment sites at least once a day (i.e. at least 30-40 meters in all directions across the island). Bait take (and consumption) will be accurately recorded into notebooks in the field for immediate inputting into a GIS-linked database back at camp for ongoing analysis. Refinements to the poisoning program can be made from this real time data and areas of high rat activity can be identified quickly and more heavily targeted throughout the program. The same personnel will also look out for any dead or dying rats or other animals, and record any evidence of non-target animals tampering with bait.

Field personnel also conduct intensive monitoring during and for several weeks after the eradication to determine that all of the rats have been eliminated (other measures may be carried out if any survivors are discovered). These include the use of baited rat traps, tracking tunnels and chocolate-flavored wax, which rats find irresistible. Note that the coverage of this monitoring grid extends beyond that of the bait stations; one monitoring point at the station and one in-between two stations.

Team leaders will also conduct inspections to ensure field personnel are applying the monitoring techniques correctly. After two to three weeks, bait take should be reduced to nil, with all the rats on the island having been poisoned. All intensive monitoring points would again be recorded on GPS, entered into the GIS-linked database and mapped to ensure coverage of the island. If rats are still detected after 6 weeks, a second baiting and continued monitoring operation would be undertaken to finish the eradication.

Long-term monitoring for surviving (or reinvading) rats generally continues for two years between the end of the eradication phase and officially declaring the island rat-free. This is based on the average life expectancy of a wild adult rat (c. 18 months). Low numbers of rats may take longer to detect than realized.

Impact monitoring

For all islands involved in this project, monitoring biodiversity and local socioeconomic indicators are important for understanding and measuring project impacts. Some protocols for monitoring certain species have already been established in Saint Lucia, which this project will add to, using standardized methods e.g. point counts of land birds, fixed point photographs and whole seabird colony counts. More details are provided in the proposal or can be given on request.

Note that the Project Manager, the project’s Alien Invasive Species Adviser and the National Coordinators will personally take part in most of the eradication, biosecurity and monitoring activities to make sure all personnel are implementing them to a high standard and in accordance with the rat eradication Operational Plans and the Biosecurity Program protocols. Particular attention will be paid to the safe handling and storage of pesticide, the field personnel’s monitoring of bait uptake (including ensuring they correct identify whether a rat or other animal has eaten it), and their overall vigilance and attention to the status and welfare of non-target species in the area.

Compliance with this Pest Management Plan

Ensuring the project does not diverge from this plan is one of the objectives (components) of this project:-

Component 6. PROJECT COMPLIES WITH CEPF-APPROVED PEST MANAGEMENT PLAN

<p>6.1 All team members in Antigua and <u>Saint Lucia</u> who are involved in handling, storage and disposal of rodenticide understand and apply the project Pest Management Plan. National reports confirm high level of compliance with pest management plan.</p>	<p>6.1 CEPF Pest Management Plan disseminated and discussed with all team members involved in rat control in Antigua and <u>Saint Lucia</u>. Project Manager and National Project Coordinators conduct random checks to ensure field personnel abide by these protocols, and expel any personnel who wilfully misuse rodenticide.</p>
<p>6.2 Independent verification that the use of rodenticide in this project follows safe and effective practices.</p>	<p>6.2 All Rat Eradication Feasibility Plans, Operational Plans, Biosecurity Protocols and other technical outputs from this project are subject to peer-review by independent experts, including Island Eradication Advisory Group and members of the IUCN/SSC Invasive Species Specialist Group.</p>

Independent peer-review of key technical plans and reports was further explained under section 31 above.

- 34. Monitoring and supervision plan, implementation responsibilities, required expertise and cost coverage.

Monitoring of the pesticide’s use is primarily the responsibility of the Project Manager and National Coordinators, although of course all field personnel and trainees will be expected to cooperate in monitoring bait uptake and any changes in native wildlife (above). The Project Manager and

project's Alien Invasive Species Adviser in experts in managing and monitoring the use of this pesticide, and will pass on these skills to the National Coordinators and other participants (some of whom are already accustomed to handling brodifacoum) as part of this project.

Monitoring costs are integrated into the operational costs of the project. Wherever possible, monitoring and supervision are combined with other project activities, to minimize costs. (For example, visits by the Project Manager will combine routine supervision with providing training and working on other project activities, and field personnel will monitor bait stations and wildlife on the islands during the same field trips). Additional monitoring and supervision visits by donors are also welcomed at any time.