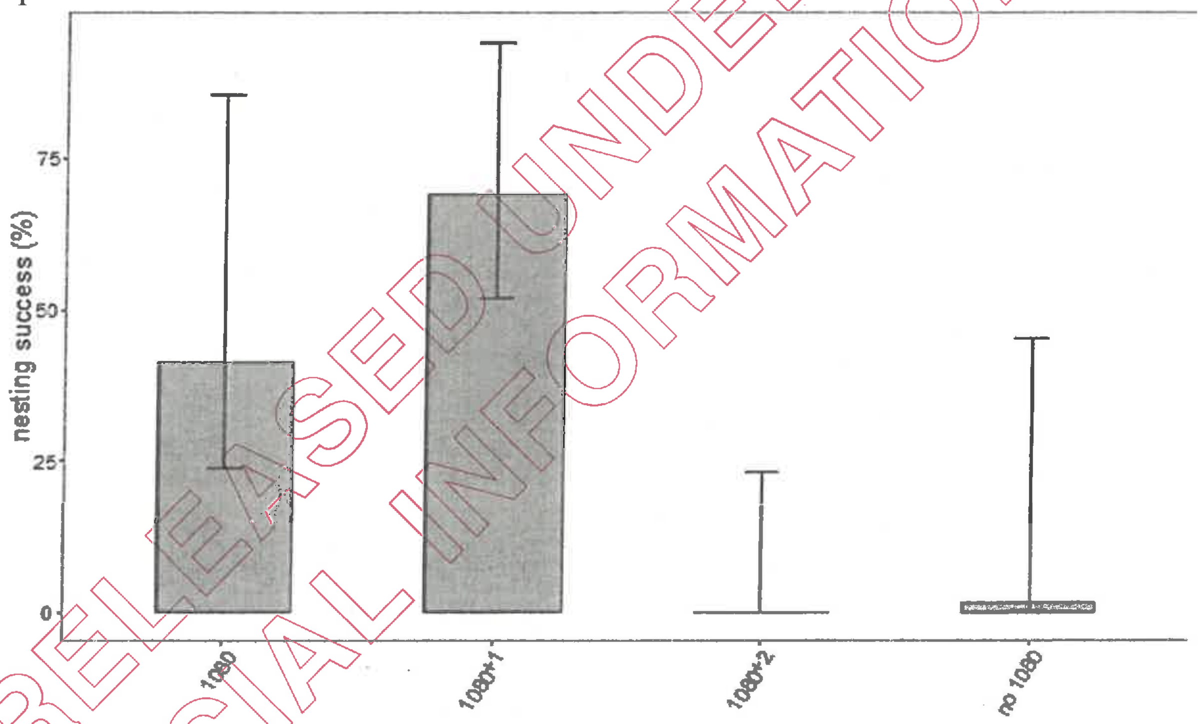
Kaka nesting success and 1080 operations

Graeme Elliott

We've monitored kaka nesting success in South Westland since 2010 and during that time kaka have bred on 4 occasions (2010, 2012, 2013, 2015). Kaka don't breed every year, they only breed when the rimu or beech trees produce seed. The area we've been working includes 2 1080 blocks that have been treated with 1080 at different times, and a non treatment area that has never received a 1080 treatment. We've thus monitored some nests in breeding seasons immediately after 1080 was applied, some a year after 1080 was applied, some 2 years after 1080 and some in the area where no 1080 has ever been applied and we've calculated the nesting success for each.

Kaka nesting success is clearly higher when it occurs within less than 2 years of a 1080 operation and much lower thereafter.



The reason for this improvement in kaka nesting success post 1080 is clear. Of the 62 nests monitored 24 of them failed, and 15 of the failures were caused by stoats and 2 by possums. 1080 is known to dramatically reduce the abundance of stoats and possums, and it follows that it would also dramatically increase kaka nesting success.

COSTS AND BENEFITS OF AERIAL 1080 FOR FOREST BIRDS IN SOUTH WESTLAND

Graeme Elliott
September 2009

Introduction

Until recently aerially applied 1080 poison was mostly used to control possums for forest canopy protection and bovine Tb management. In the past few years aerial 1080 has been increasingly used to control possums, rats and stoats to protect a wide range of native forest animals. At the same time as aerial 1080 is being increasingly used as a multi-pest control tool, public disquiet about it's use has also increased.

There is good evidence that aerial 1080 kills possums (Eason *et al.* 2000), rats (Innes *et al.* 1995) and stoats (Murphy *et al.* 1999), and the reduction in the incidence of bovine Tb (Coleman & Livingston 2000) and the benefits to vegetation through reduced possum browse (Norton 2000) have been well demonstrated. Although the levels of bykill of some forest birds have been assessed, levels of bykill of many other species have not been assessed and the benefits of aerial 1080 use to forest birds have been assessed for very few species (Spurr & Powlesland 1997).

There is a widely held but unsubstantiated view that use of aerial 1080 leads to dramatic reductions in the abundance of native forest birds. The best available evidence suggests that use of aerial 1080 has little impact on most forest birds and has significant benefits to some species, but there has been no comprehensive assessment the costs and benefits of aerial 1080 use to native forest animals. Furthermore recent changes in the way aerial 1080 is used in order to improve kill rates of rats and stoats and well as possums, means that some earlier work assessing costs and benefits to native wildlife may no longer be relevant.

This study aims to measure the costs and benefits to a range of native forest animals of the repeated use of aerial 1080 to control possums, rats and stoats at three or more sites.

Study Areas

Two sites have so far been chosen, the Tararuas in the Southern North Island, and near Lake Moeraki in South Westland.

The Tararua study area and methods are described in detail in DOCDM-438321.

The South Westland study site comprises 3 bocks of between 12,000 and 18,500 ha (Figure 1). The 12,000ha Ohinemaka block will be a control block in which no pest control will be undertaken. The other two blocks (Abbey Rocks and Whakapohai) will be treated with aerially applied 1080. In one of the treatment blocks (multi-pest control block) aerial 1080 will be applied as often as is needed to suppress, rats, stoats and possums, probably about once every three years. In the other (possum control block) aerial 1080 will be used only as often as is necessary to control possums. 1080 has previously been sown over the Whakapohai and Abbey Rocks blocks to control possums, whereas in the Ohinemaka block no systematic possum control has been attempted.

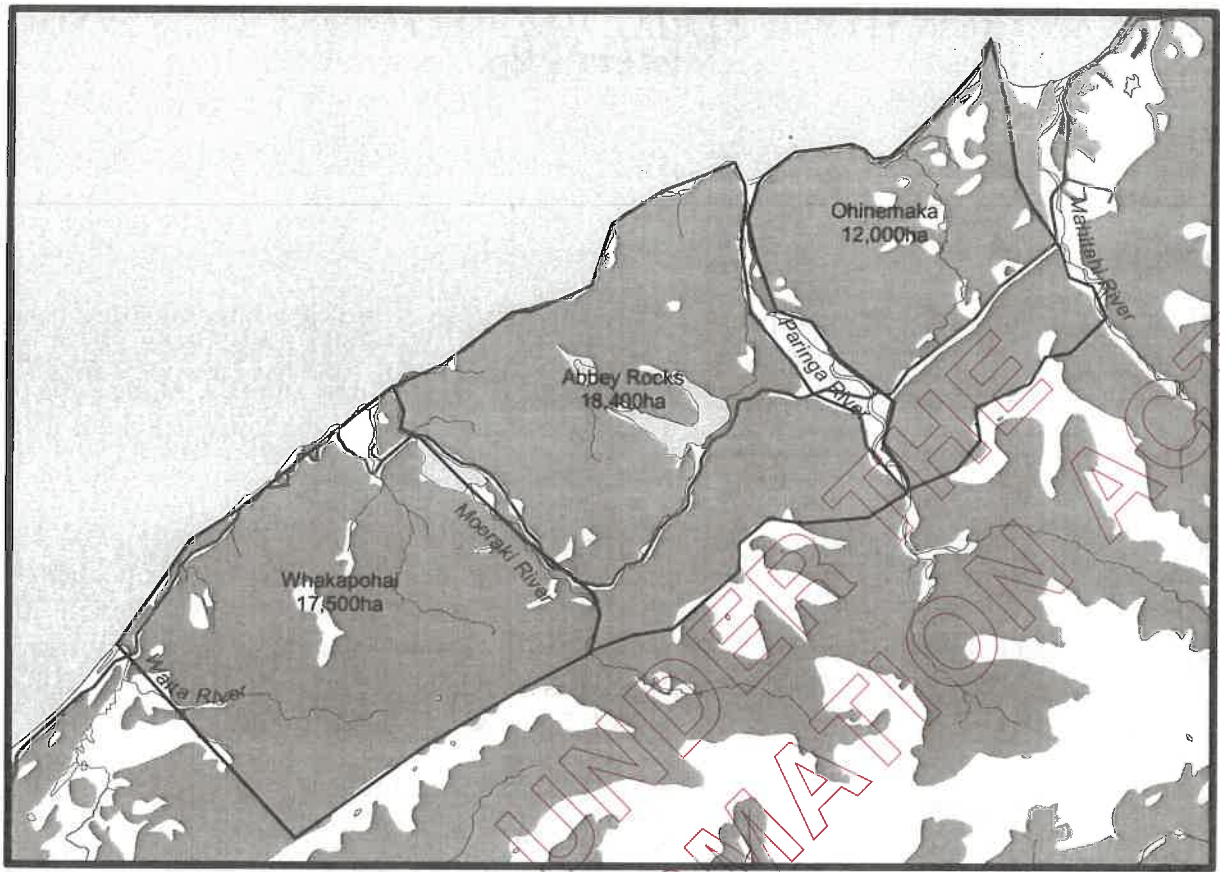


Figure 1. Study sites in South Westland.

Methods

In each of the blocks the abundance of rodents, mustelids and possums and a suite of forest birds will be regularly monitored. In addition the seedfall of rimu and silver beech will be monitored using seedfall funnels and one species of bird will be studied intensively.

Duration of the study

The study will last 6 years commencing October 2009.

Timing of 1080 application

No 1080 applications are planned for the Whakapohai or Abbey Rocks blocks for the 2009-2010 financial year. But thereafter the application of 1080 will be triggered by beech or podocarp seedfalls, or high rat, stoat and possum abundances. Thresholds for the triggering of 1080 application will be worked out during the first year of study through a collaborative exercise between Research and Development and Conservancy staff. I anticipate that the Whakapohai block will receive aerial 1080 for possum control approximately once every 6 years (probably in winter 2011), the Abbey Rocks will receive aerial 1080 for rodent, mustelid and possum control approximately once every 3 years, and the Ohinemaka block will receive no systematic pest control.

Rodent and mustelid monitoring.

Rodents and mustelids will be monitored using DOC standard tracking tunnel techniques (Gillies & Williams 2002).

20 tracking tunnels lines of 10 tunnels will be set up in each block. They will be run four times a year, in November, February, May and August.

Tracking tunnels will be placed in each block using a generalised random tessellation stratified design (GRTS) (Stevens & Olsen, 2004). GRTS is a compromise between random and grid sampling that ensures spatially balanced samples and enables increases or decreases in the number of sample points without compromising spatial balance.

Possum monitoring

Possum monitoring will be undertaken annually with wax tags using the standard protocol (NPCA, 2008). This will be in addition to the regular possum trap catch monitoring that is undertaken every two years in the Abbey Rocks and Whakapohai blocks.

40 wax tag lines comprising 20 wax tags at 10m intervals will run in each block annually in November.

Wax tag lines will be placed using GRTS (Stevens & Olsen 2004) and would need to be placed at new locations each year to avoid possums becoming tag-happy or tag-shy.

Bird monitoring

Bird monitoring will be undertaken using automatic acoustic monitoring (Rempel *et al.* 2005). Recording devices will be placed in the forest and recorded samples of bird calls later analysed to provide indices of bird abundance.

Automatic recording will be used in preference to ordinary bird counting because:

1. A larger number of samples can be collected.
2. Variability in bird counts can be reduced by taking samples for only a restricted part of the day.
3. A programme of picking up and moving recording devices on fine days, and analysing recordings on rainy days will enable more efficient use of time in a rainy environment.
4. Bird calls can be identified more reliably and a regime of checking identification can be implemented.
5. Automatic recording devices facilitate blind random sampling. Sampling sites can be placed at random and the workers analysing the bird calls need not know where the samples come from.
6. Recordings can be stored and if necessary re-analysed.

Bird recording will be undertaken from sites chosen using GRTS (Stevens & Olsen 2004). The number of sites used for bird counting will be decided after a preliminary series of bird counts undertaken in November 2009. I anticipate that approximately 100 bird counting stations will be established in each of the three blocks.

Once the preliminary analysis is undertaken automatic bird counts will be undertaken during January and February each year as this is the best time of year to monitor kaka and kakariki. Kaka and kakariki are much less abundant than most of the other species we want to monitor, so that any programme that has enough power to detect changes in kaka or kakariki abundance will also almost certainly be good enough to detect changes in the other species.

Should the preliminary analysis of the automatic bird counts show that the automatic bird counting is not reliable then our back-up plan will be to monitor birds using five-minute bird counts. This will require a re-think of the sampling regime.

Seedfall monitoring

Rimu and silver beech seedfall monitoring will be undertaken by seedfall collection and by counting developing rimu seeds in trees.

20 rimu trees at a range of altitudes and topographies will be sampled in April each year to anticipate the likely seedfall in the following April using methods perfected by the Kakapo team (Harper *et al.* 2006).

20 seedfall collection devices will be placed randomly in rimu forest and 20 in silver beech forest to estimate annual seedfall production. Seedfall collection devices will be activated in February at the beginning of the beech and rimu seedfall, and collected in June once all the seed has fallen.

Intensive bird study

Riflemen in study areas in each of the three blocks will be intensively monitored during each breeding season to measure survivorship and productivity. Birds caught in mist nets, colour banded and their nests searched for and monitored.

Logistics

Personal

5 staff will be in the field continuously from November to March each summer. One of the five will be a supervisor, and the project will be managed by Graeme Elliott from Nelson, who will spend about a month in the field each season.

Accommodation

Staff will be accommodated in a rented house in Haast. Analysis of bird counts and entering of data will be undertaken in this house, or at the Haast Visitor Centre – if they've space and are willing to have us.

Transport

The five staff will have a 4WD double cab ute.

References

Eason, C.; Warburton, B.; Henderson, R. 2000. Toxicants used for possum control. Pages 154 - 163 in Montague, T.L. (editor). The brushtail possum. Manaaki Whenua Press, Lincoln, New Zealand.

Murphy, E.C.; Young, J.B.; Robbins, L.; Dowding, J.E. 1999. Secondary poisoning of stoats after an aerial 1080 poison operation in Pureora Forest, New Zealand. New Zealand Journal of Ecology 23: 175-182.

Gillies, C.; Williams, D. 2002. Using tracking tunnels to monitor rodents and mustelids. Unpublished report, Department of Conservation. HAMRO-66179.

Harper, G.A.; Elliott, G.P.; Eason, D.K.; Moorhouse, R.J. 2006. What triggers nesting of kakapo (*Strigops habroptilus*)? Notornis 53: 60-63.

Innes, J.; Williams, D.; Speed, H.; Warburton, B.; Bradfield, P. 1995. Large-scale poisoning of ship rats (Rattus rattus) in indigenous forests of the North Island, New Zeland. New Zealand Journal of Ecology 19: 5-17.

Coleman, J.; Livingston, P. 2000. Fewer possums: less bovine Tb. Pages 220 - 231 in Montague, T.L. (editor). The brushtail possum. Manaaki Whenua Press, Lincoln, New Zealand.

National Possum Control Agencies 2008. Possum control monitoring using the wax tag method. National Possum Control Agencies, Wellington.

Norton, D. 2000. Benefits of possum control for native vegetation. Pages 232 - 240 in Montague, T.L. (editor). The brushtail possum. Manaaki Whenua Press, Lincoln, New Zealand.

Rempel, R.S.; Hobson, K.A.; Holbom, G.; Van Wilgenburg, S.L.; Elliott, J. 2005. Bioacoustic monitoring of forest songbirds: interpreter variability and effects of configuration and digital processing methods in the laboratory. Journal of Field Ornithology 76: 1-11.

Spurr, E.B.; Powlesland, R.G. 1997. Impacts of aerial application of 1080 on non-target native fauna. Science for Conservation 62. Department of Conservation, Wellington.

Stevens, D.L.; Olsen, A.R. 2004. Spatially balanced sampling of natural resources. Journal of the American Statistical Association 99: 262-278.

Department of Conservation *Te Papa Atawhai*	*INVESTIGATION MANAGEMENT FORM*			
IMPORTANT ***Instructions on using this form are in hidden text. Switch on/off hidden text using the show/hide formatting button (¶) on your standard on your standard toolbar.***				
Date received:	**Section**	**Threats Science**	**Investigation No.**	**4166**
	Key Output	**2.02**	**# WBS No.**	**5587007003**
This form must be submitted electronically in MSWord format to the Sue Curran, Business Support Officer scurran@doc.govt.nz or R&DContracts@doc.govt.nz (Contracts and CITES Team, National Technical Services Unit, Department of Conservation, Conservation House, 18-32 Manners Street, Wellington)				

# INVESTIGATION TITLE	**Population dynamics of native wildlife at sites receiving aerial 1080 treatment to suppress predators – ecological costs and benefits.**

R&D PERSONNEL #	
#DOC INVESTIGATION LEADER (or Contract Supervisor)	Dr Graeme Elliot
SUPERVISORS MANAGER	**Susan Timmins**
Collaborators	

THIS DOCUMENT IS **NOT** A CONTRACT

OVERVIEW #	Aerially applied 1080 poison is used in possum-control programmes to reduce the incidence of bovine TB, reduce browse on palatable plants and reduce predation on kokako, kiwi and land snails. It is used less often to control rats and stoats for the benefit of susceptible wildlife, such as during Operation Ark programmes that aim to protect birds like mohua and whio. Some of the public concern about aerial 1080 baiting operations arises from unsubstantiated claims of serious impacts on native wildlife yet the best evidence available is that bird and bat populations benefit from aerial 1080 use through reductions in predation by possums, stoats and rats. This evidence is not widely accepted, partly because measurements of by-kill rates and subsequent population growth have not been systematically made at the same sites nor have they been related to ongoing changes in pest densities. Most of the research aimed at improving the effectiveness of aerially applied 1080 use has focussed on reducing pest densities (e.g. Landcare Research's "Local Elimination" programme), reducing the incidence of bovine TB, or reducing damage to forest plants by browsing. There has been very little research aimed at increasing densities of pest-sensitive native forest wildlife through use of aerially applied 1080. In this study, bird and pest populations will be measured before and following two applications of aerial 1080 at three forested sites in order to • quantify changes in bird abundance and in adult female survival and productivity at a pair of sites in each forest to compare treated (1080) and untreated (no 1080) blocks • quantify changes in possum, rat and stoat densities indexed by traps and tracks in treated and untreated blocks and relate to time since poisoning • model the potential for refinement of the scale, timing and frequency of aerial 1080 use in order to minimise costs and maximise benefits to native species, based on the results. Regular updates on DOC's website and communiqués from the Marketing and Communications Group will allow interested members of the public to follow the research as it happens.
JUSTIFICATION #	Current aerial 1080 use predominantly aims to kill possums in order to reduce the incidence of bovine TB, reduce possum browse of palatable plants and reduce predation of kokako, kiwi and land snails. The effectiveness of 1080 for these three functions has been well demonstrated. Aerial 1080 has considerable potential to be used in future as a multi-pest control tool to kill stoats and rats as well as possums for the benefit of a wide range of native wildlife. The development of aerial 1080 as a multi-pest control tool offers considerable potential benefit to native wildlife particularly in remote areas where other forms of pest control are prohibitively expensive. Without an effective predator-control tool for remote situations many species of native wildlife are destined to become extinct on the mainland and confined to only a few predator-free islands. In many New Zealand forests the abundance of pests and the productivity and mortality of many native animals is strongly correlated with the mast fruiting of forest trees. 1080 use regimes that are synchronised with spikes in pest abundance caused by mast seeding are likely to have the greatest benefit to a wide range of native animals. However many forests comprise mosaics of forest patches of different types and the masting of trees and abundances of pests may not be synchronised between patches. In forests comprising many diverse patches the optimal 1080 use might be to treat with 1080 at strictly regular intervals, In

contrast, forests comprising only one forest type might be better treated with irregular 1080 applications that are synchronised with peaks of pest abundance.

This program aims to rigorously demonstrate the effect of repeated aerial 1080 use on a wide range of native wildlife and thus enable a comprehensive assessment of the costs and benefits of its use on native biodiversity. It will also provide data which can be used to model the timing, frequency and scale of aerial 1080 use that maximises its benefit, and this will feed into an adaptive management framework which will provide tools for the determination of optimum 1080 use regimes.

If this research delivers the results that earlier work suggests, then it will:

1. Demonstrate that sophisticated use of aerial 1080 has comprehensive benefits to native biodiversity.
2. Inform Current Best Practice for multi-pest control via bait specifications, timing, scale and frequency of use that enable managers to minimise the negative effects and maximise the positive effects of aerial 1080 use
3. Help allay public fears that aerial 1080 use has a devastating impact on native wildlife.

BUSINESS OWNER #	1080 Coordinating Committee

Project Objective(s) ##

1. Measure bird, possum, rat and stoat abundance at three blocks in each of 3 forests, to obtain measures "before" any 1080 application.
2. Use indices of pest and bird abundance to plan a regime of application of aerial 1080 to produce the maximum benefit to a range of native wildlife.
3. Continue measurements after aerial 1080 baiting in the 3 treatment blocks, to be able to compare bird and mammal population trajectories in the treated and untreated blocks.
4. Measure female survival and productivity for one focal bird population at each forest to learn the demographic outcome of controlling the mammals
5. Relate bird population dynamics to changes in pest densities and 1080 operational specifications
6. Keep interested members of the public informed of research progress and final results
7. Publish replicated study in a peer-reviewed scientific journal

SOURCE OF FUNDS FOR THE INVESTIGATION #

Source	$ from source Indicate the $ coming from the sources on the left	Comments
Business Planning	$125,000 pa for 6 years - $750,000	While money was allocated in for 2009/10 an allocation is yet to be assured for the 5 outyears.
AHB	$125,000 pa for 6 years - $750,000	Commitment made for 6 years

TENDERING ## REQUIRED – IF APPLICABLE	
Is this an internal investigation	Yes

COLLABORATIONS	External to DOC	Wendy Ruscoe, Mandy Barron, Penn Holland - Landcare Research Philippa Crisp Greater Wellington Regional Council
	R&D	Josh Kemp
	Conservancies	James Griffiths - Wellington Hawke's Bay Conservancy
	Area Offices	

DEPENDENCIES

What actions are required before the investigation or services can commence, or move to a next stage. Examples include: all data entered into a specific database, or aerial 1080 drop completed by Area Office or a specific piece of equipment purchased or a person with specific skills recruited.

Item	Activity/Action Required	Person responsible	Required date
Pest control			

FIELDWORK SITES ##	DOC Land	Two sites will be finalised in Milestone One. Likely sites are: 1. Tararua Forest Park 2. South Westland 3. Marlborough Sounds

AGREEMENT BY DOC AREA OFFICE OR CONSERVANCY (AS APPROPRIATE) ##	**I NOTE** that: ☐ Research team led by Graeme Elliott will be working on DOC land over the period 1/11/2009 – 1/7/2015. ☐ The location of this work is between the Haast and Wahitahi Rivers and the coastal ranges and the sea. The South Westland- Weheka Area Office is required to provide the following support : Radio Scheds Occassional use of a computer to do timesheets. **AND** ☐ The R&D investigation leader will contact me at least five days prior to <u>each occasion</u> they enter the area. This is to ensure that I can advise any new any new hazards, and so that my staff can be aware that work is being undertaken. ##### Signed: Area Manager South Westland - Weheka Area Office Date: 1 / 10 / 2010

METHOD(s) ##

Study Design

The study will monitor the effect on birds and pests of repeated 1080 use at three sites through 2 applications of 1080 over a period of 6 years (see *Site and species selection*).

At each of 3 study sites there will be 3 blocks receiving three different treatments. One block at each site will be treated with aerial 1080 with a timing and frequency optimised to benefit native wildlife (see *Determining appropriate return time for 1080 use*). Another block at each site will be treated on a less frequent regime optimised to cost-effectively keep possums below pre-determined levels of abundance. A third block at each site will receive no treatment.

In all the blocks at all sites the populations of a suite key native bird species will be monitored annually for 6 years (see *Population dynamics measurement*).

In all blocks at all sites pest animal abundances will be indexed at least annually (see *Changes in pest abundance*).

In the treatment blocks in years when aerial 1080 is applied, accidental bykill of a few species will be monitored (see *1080 bykill measurement*).

Relationships between changes in abundance of measured bird species, time since last 1080 application and pest species indices will be examined using linear or non-linear mixed effects models. These models will provide parameter estimates for simulation models which will refine predictions of the optimum timing and frequency of 1080 use.

Site and species selection

Research will be carried out at three sites where the Department is committed to a minimum of 3-yearly aerial 1080 baiting. The sites will have to be large (≥20,000 ha) to incorporate 2 treatment blocks (≥10,000ha) in order to minimise rates of re-invasion by pest species and thus maximise the likely duration of pest suppression caused by the use of aerial 1080. Non-treatment blocks will also be established at each site.

A set of birds known to be prey for rats and stoats but still present at the study sites will be chosen for measurement.

Determining appropriate return time for 1080 use

Data for the selected species will be used for population modelling, using age-structured matrix models to predict dynamics in years when aerial 1080 is applied and in years thereafter. Where there is insufficient information to construct matrices, approximations will be made using data for related species in New Zealand or overseas.

The minimum frequency of 1080 application that will lead to population growth for each bird species in the set will be modelled, and an optimisation routine will be run to find the treatment frequency that is predicted to maximise the benefit to most species in the set.

Population dynamics measurement

The methodology will depend on the species.

An initial power analysis will be undertaken using historical data to assess the variability and power of each potential measurement method for each selected species.

A wide range of species will be monitored at low intensity using annual point counts, transect counts, or distance sampling

A smaller number of species will be monitored more intensively using techniques appropriate for the species. Techniques used will include, mist netting of birds and bats, harp trapping of bats, individual marking using rfid tags, leg bands and radio transmitters, finding nests and roost sites, and using re-sightings to estimate mortality.

<u>Changes in pest abundance</u>

Mustelid and rodent abundance will be indexed using tracking tunnels run four times a year according to the Department's best practice for tracking tunnels.

Possum abundance will be indexed once a year using waxtags along the same lines used for the mustelid and rodent monitoring.

<u>1080 bykill measurement</u>

Up to five bird and/or bat species that are known to be or are likely to be vulnerable to 1080 poisoning will be included in a programme of 1080 bykill measurement.

The methodology will depend on the species, but in essence individuals will be marked with either leg bands, rfid tags or radio-transmitters, and their survivorship immediately after aerial 1080 operations measured using mark-re-sight techniques.

PROJECT MANAGEMENT

NOTE TO PROJECT LEADER

It will be assumed that the project leader will:

- Establish a project plan for this investigation and gain all necessary permissions.
- Secure all co-workers and support staff necessary for the successful completion of this investigation, including any DOC colleagues.
- Secure all other funding for the investigation, if multi-agency funded.
- Consult with agency stakeholders, iwi, or other parties where applicable.
- Fully cost the work and its planned outputs.

TIMETABLE			
Proposed Start Date:	1 July 2009	**Proposed Finish Date:**	30 June 2015

IDENTIFICATION OF MILESTONES

This section will be cut and pasted into a contact

Milestone /Phase / Year	Key tasks	Performance measures	Finishing Date	Associated Cost NZ$
Preparation required from Supervisor Tasks or preparation required from the DOC Supervisor / Project leader before undertaking the work, e,g., planning, selecting sites, scoping work required	• Site selection • Species selection • Poisoning regime development • Sampling regime development	• Sites selected • Species selected • Rough models of selected species developed optimum poisoning regime identified and documented • Sampling regime developed and documented.	• 1 December 2009 • 1 December 2009 • 1 January 2010 • 1 January 2010	
Milestone 1: Site and species selection *Output from the Milestone:* Report on site and species selection.	T1.1 Species selection T1.2 Site selection	T1.1 Species selected T1.2 Sites selected	1 December 2009 1 December 2009	
Milestone 2: Measuring protocols for selected species *Output from the Milestone:* Work plan for measuring selected species.	T2.1 Identify or devise measuring regimes for selected species.	T2.1 Measuring regimes identified or devised.	1 January 2010	

Milestone 3: Aerial 1080 regime development *Output from the Milestone:* Report on rough models and aerial 1080 regime. Presentation to DOC's Marketing and Communications Group	T3.1 Develop rough models of the population dynamics of selected species T3.2 Devise aerial 1080 regime that maximises the benefit to the modelled species.	T3.1 Rough models of the population dynamics of selected species developed T3.2 Aerial 1080 regime that maximises the benefit to the modelled species devised	1 January 2010 1 March 2010	
Milestone 4: Annual Reporting 2010	T4.1 Produce annual report T4.2 Make annual presentation to MCG, 1080 coordinating committee, AHB and other stakeholders.	T4.1 Produce annual report T4.2 Make annual presentation to MCG and other stakeholders.	1 August 2010 1 August 2010	
Milestone 5: Annual Reporting 2011	T5.1 Produce annual report T5.2 Make annual presentation to MCG, 1080 coordinating committee, AHB and other stakeholders.	T5.1 Produce annual report T5.2 Make annual presentation to MCG and other stakeholders.	1 August 2011 1 August 2011	
Milestone 6: Annual Reporting 2012	T6.1 Produce annual report T6.2 Make annual presentation to MCG, 1080, AHB coordinating committee and other stakeholders	T6.1 Produce annual report T6.2 Make annual presentation to MCG and other stakeholders.	1 August 2012 1 August 2012	
Milestone 7: Annual Reporting 2013	T7.1 Produce annual report T7.2 Make annual presentation to MCG, 1080 coordinating committee, AHB and other stakeholders.	T7.1 Produce annual report T7.2 Make annual presentation to MCG and other stakeholders.	1 August 2013 1 August 2013	

Milestone 8: Annual Reporting 2014	T8.1 Produce annual report T8.2 Make annual presentation to MCG, 1080 coordinating committee. AHB and other stakeholders.	T8.1 Produce annual report T8.2 Make annual presentation to MCG and other stakeholders.	1 August 2014 1 August 2014	
Milestone 9: Annual Reporting 2015	T9.1 Produce annual report T9.2 Make annual presentation to MCG, 1080 coordinating committee, AHB and other stakeholders.	T9.1 Produce annual report T9.2 Make annual presentation to MCG and other stakeholders.	1 August 2015 1 August 2015	
Milestone 10: Final reporting	T10.1 Analyse results and prepare paper for scientific journal. T10.2 Make presentation at appropriate scientific conference.	T10.1 Paper submitted. T10.2 Presentation presented.	1 Jan 2016 1 July 2017	

OUTPUT(s) FROM THE INVESTIGATION		
Output Type	**Description of required output**	**Due Date**
DOC Science Report		
▪ **Science for Conservation**		
▪ **DOC Research and Development Series**		
DOC Technical report		
▪ **Documented method**		
▪ **Standard operating procedure (SOP)**	Consultation with Pesticides advisory Group to ensure that the findings of this study are incorporated into pest control SOPs.	
▪ **Recovery plan**		
▪ **Communication statement**		
▪ **Briefing for MCG staff**	One field trip each year to a site in the project, to show MCG staff the methods and to brief them on results to date, so they can respond knowledgeably to enquiries and criticisms of 1080 work	
▪ **Data**		
▪ **Database**		
▪ **Seminar**	Annual presentation to MCG, 1080 coordinating committee and AHB.	
▪ **Workshop**		
Science paper – in external peer reviewed journal	Manuscript on dynamics of focal species exposed to two cycles of aerial 1080 operations targeting rats and stoats	
Conference presentation	Presentation on dynamics of focal species exposed to two cycles of aerial 1080 operations targeting rats and stoats	
Other		

ETHICS, REGULATORY AND OTHER OBLIGATIONS ## Mandatory as many of these are statutory requirements		
Item	**Description**	**Required (yes/no/NA)**
ERMA approval		No
HSNO Act		No
Exemptions under the Biosecurity Act (s52 and/or 53)		No
Human Ethics approval		No
Animal Ethics Committee Approval		No
Permits	May require permits to catch and mark animals.	Yes
Plant collection		No
Animal collection		No
Access	All DOC land with public access.	No
Iwi consent or consultation	Consultation with iwi at the chosen sites will be undertaken, though it is not required.	No

RISK PROFILE ##	Identify the actual risks associated with the investigation (including possible causes of delay). Describe the actions required to manage the risks identified.	
	Risks identified	**Management of risks identified**
Public interest	Public antipathy to 1080 use could prevent the required 1080 operations from going ahead.	This study is designed to address some aspects of public antipathy to aerial 1080 use – it is part of the solution.
Conservation impact		
Visitor satisfaction		
Financial	Finances not secured for 6 year term of project	Keep 1080 coordinating committee and AHB well informed.
Iwi		
Operational		
Staff	Ability to employ sufficient staff given Government imposed staff ceiling	
Total		

FINANCE DETAILS ##

Notes:

(a) Full costs should be shown in New Zealand dollars for each financial year. The DOC financial year runs from 1 July to 30 June. Funding sources other than DOC should be shown if known or planned. DOC does not commonly fund investigations longer than 3 years – discuss with the Science Manager if over three years.

(b) Do NOT include GST. Costs exclusive of GST

(c) DOC reserves the right to recover equipment purchased using DOC funds on completion of the investigation.

(d) Identify any revenue which may/would become payable to DOC from your investigation activities.

This form may be used for investigations that involve both external (contract) science providers and in-house providers working in collaboration; the costs must, however, be clearly separated using the boxes provided.

F2 FUNDING FOR RD&I SCIENCE SECTION PERSONNEL

Use this table to cost RD&I internal investigations.

Plus two more years at $125k per year

	Year 1		**Year 2**		**Year 3**		**Year 4**	
	2009/2010		**2010/2011**		**2011/2012**		**2012/2013**	
	Perm Staff hours	**Year 1 NZ$**	**Perm Staff hours**	**Year 2 NZ$**	**Perm Staff hours**	**Year 3 NZ$**	**Perm Staff hours**	**Year 4 NZ$**
Personnel costs (permanent staff hours or wages dollars)								
1.Graeme Elliott	0.3FTE		0.2FTE		0.2FTE		0.2FTE	
2.Josh Kemp	0.1FTE		0.1FTE		0.1FTE		0.1FTE	
3.Wages		160,000		190,000		190,000		190,000
Total staff time/wages costs	0.4FTE	160,000	0.3FT E	190,000	0.3FTE	190,000	0.3FTE	190,000
Travel and related costs		30,000		30,000		30,000		30,000
Equipment costs								
GPSs		6,000						
Binocs		12,000						
Sound Gear		6,000						
PPE		6,000						
Consumables (supplies, materials, etc.)		10,000		10,000		10,000		10,000
Other								
Total operating cost sought from DOC National Science Budget (excluding GST)	0.4FTE	125,000	0.3FTE	125,000	0.3FTE	125,000	0.3FTE	125,000

THIS DOCUMENT IS NOT A CONTRACT

	Year 5		Year 6	
	2013/2014		2014/2015	
	Perm Staff hours	**Year 2 NZ$**	**Perm Staff hours**	**Year 3 NZ$**
Personnel costs (permanent staff hours or wages dollars)				
1.Graeme Elliott	0.2FTE		0.2FTE	
2.Josh Kemp	0.1FTE		0.1FTE	
3.Wages		190,000		190,000
Total staff time/wages costs	0.3FT E	190,000	0.3FTE	190,000
Travel and related costs		30,000		30,000
Equipment costs GPSs Binocs Sound Gear PPE				
Consumables (supplies, materials, etc.)		10,000		10,000
Other				
Total operating cost sought from DOC National Science Budget (excluding GST)	0.3FTE	125,000	0.3FTE	125,000

F3 CO-FUNDING TO BE ALLOCATED BY ANOTHER DOC UNIT

This table collates the funding and in-kind support from Divisions (other than RD&I), Conservancies and Area Offices.

In every case, the Conservator (or their nominee), Area Manager (or nominee) or Division or Unit manager must agree the resources that they are willing to contribute to a RD&I investigation.

	Specify DOC units providing co-funding	Personnel involved with project
Conservancy	**Wellington Hawke's Bay Conservancy**	**James Griffiths and Jack Mace**
Area Office	**Kapiti and Wairarapa Area Offices**	**Colin Giddy, Bruce Vander Lee and other Area Office staff as required**
Area Office	**Weheka Area Office**	**Jo MacPherson, Gary Scott and Pat Dennehy**
Other DOC Division or Unit		

Logistical (in-kind) support (Give details)	Wellington Hawke's Bay Conservancy will undertake regular aerial 1080 pest control, pest and bird monitoring in the Tararuas. Weheka Area office will undertake 1080 operations, provide input into the planning of this research, and provide help with radio scheds and occasional use of office facilities.
CO-FUNDER AUTHORITY	I certify that the resources required from this Conservancy/Unit/Area Office are provisionally available and will be covered in draft business planning but are subject to final business planning approvals. **Name: (print)** **Signature:** **Date:** I certify that the resources required from this Conservancy/Unit/Area Office are provisionally available and will be covered in draft business planning but are subject to final business planning approvals. **Name: (print)** **Signature:** **Date:**

F4 FUNDING PROVIDED BY EXTERNAL AGENCIES					
	2009/2010	2010/2011	2011/2012	2012/2013	Plus 2 more years at $125k pa
	Year 1	Year 2	Year 3	Year 4	Total (excl GST)
AHB	125,000	125,000	125,000	125,000	750,000
TOTAL FUNDING PROVIDED BY EXTERNAL AGENCIES	125,000	125,000	125,000	125,000	750,000

GRAND TOTAL FOR INVESTIGATION					
	2009/2010	2010/2011	2011/2012	2012/2013	Plus 2 more years at $250k pa
	Year 1	Year 2	Year 3	Year 4	Total (excl GST)
F2 FUNDING FOR RD&I SCIENCE SECTION PERSONNEL	125,000	125,000	125,000	125,000	750,000
F4 FUNDING PROVIDED BY EXTERNAL AGENCIES.	125,000	125,000	125,000	125,000	750,000
Total investigation value	250,000	250,000	250,000	250,000	150,000

AUTHORITY Budget-holding or accountable manager to complete this section	My section has the resources (staff, financial, equipment) to undertake this investigation. I agree that this investigation can be undertaken in the manner described within this IMF.	
R&D Manager **Susan Timmins** **Threats Science Manager**	**Signature:**	**Date:**
Any comments or directions from the Manager	I endorse the approach being taken by this research team to seek external peer review of the work described here.	

ENDS

Kaka and 1080: Preliminary Results

Graeme Elliott

May 2017

Kaka belong to a family of parrots including the kea that occur only in New Zealand. They were once very abundant, but they suffer high rates of predation from stoats and possums[1] particularly while nesting. Their populations are declining and they are regarded as Nationally Vulnerable[2] though they are still widespread.

1080 is very effective at killing both possums and stoats (by secondary poisoning) and it seems likely that the regular use of 1080 should lead to recovery of kaka populations.

This study aims to determine whether kaka benefit or suffer from the repeated use of aerially applied 1080 used to control rats, stoats and possums.

Study area

The study was undertaken in South Westland between 2010 and 2016 in three adjacent blocks of forest (Figure 1), two of which received regular 1080 treatment (but on different timetables), and one block which has never been treated with 1080. There have been five 1080 drops in the two treatment blocks during our study.

[1] Moorhouse, R.; Dilks, P.; Greene, T.; Powlesland, R.; Moran, L.; Taylor, G.; Jones, A.; Knegtmans, J.; W 2003. Control of introduced mammalian predators improves kaka Nestor merdionalis breeding success: reversing the decline of a threatened New Zealand parrot. Biological Conservation 110: 33-44.

[2] Robertson, H.A.; Dowding, J.E.; Elliott, G.P.; Hitchmough, R.A.; Miskelly, C.M.; O'Donnell, C.F.J.; Powlesland, R.G.; Sagar, P.M.; Scofield, R.P.; Taylor, G.A. 2012. Conservation status of New Zealand birds, 2012. New Zealand threat classification series 4, Department of Conservation, Wellington.

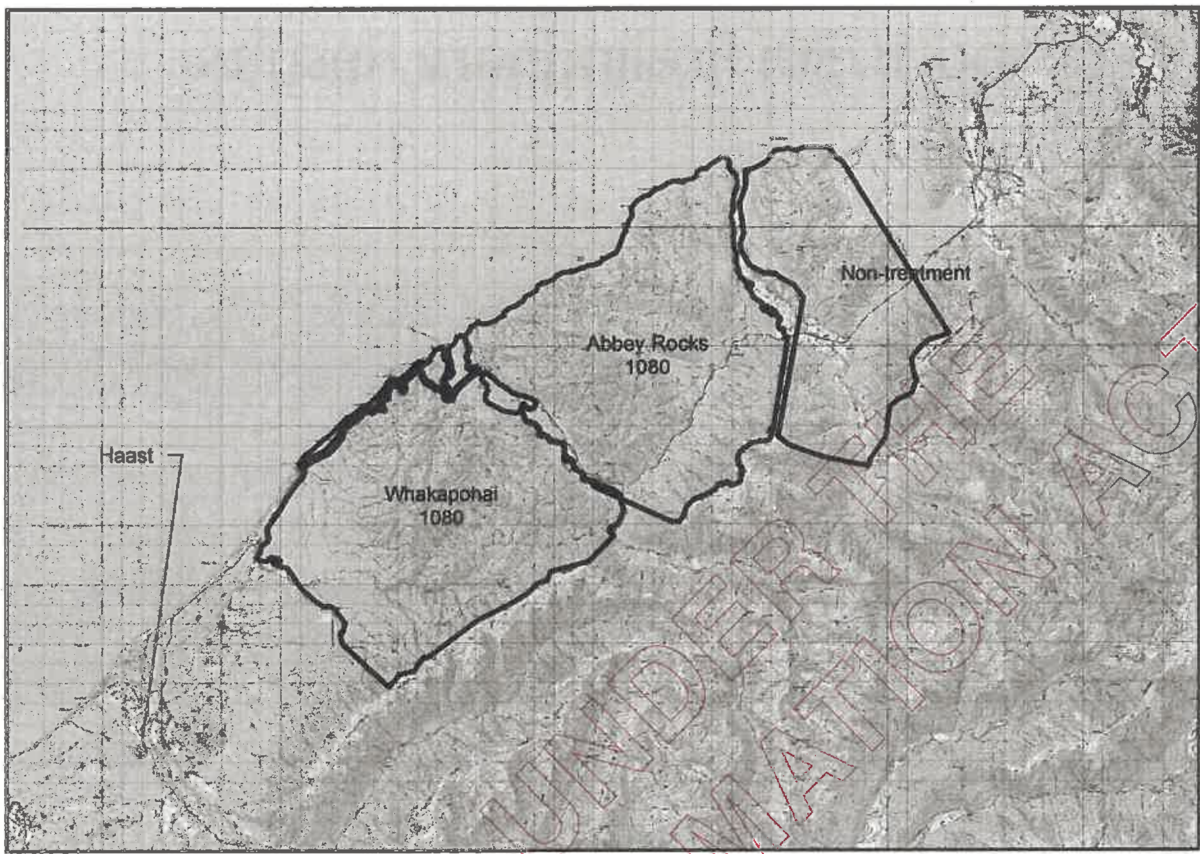


Figure 1: Study areas in South Westland.

Methods

Kaka nesting success and survival were used to assess the impact of aerially applied 1080 on their populations.

Kaka were captured in mist nests placed high in the forest canopy to which they were attracted using recorded calls. Captured birds were radio-tagged and subsequently followed using radio-telemetry to measure their survival and to find their nests.

When nests were found, they were monitored by climbing the trees and looking in the nests at regular (mostly weekly) intervals and using automatic cameras placed at the nest entrances to record the comings and goings of adult and fledgling kaka and predators.

Survival of radio-tagged birds was assessed by regularly checking their radio signals – the signals change when the birds die.

Both nests and bird survival were estimated using the methods of Dinsmore *et al.* (2002)[3], implemented in program Mark.

---

[3] Dinsmore, S.J.; Knopf, F.; White, G.C. 2002. Advanced techniques for modeling avian nest survival. Ecology 83:3 476-3488.

Results

The results of this work are currently being analysed and written- up for publication in the scientific literature: the following is a summary of preliminary results available at the time of writing (May 2017).

Between 2010 and 2016 we radio-tagged and monitored 68 kaka, and 60 kaka nests. Kaka only breed when there is abundant fruit and they bred 4 times in our study in 2010, 2012, 2013 and 2015.

Kaka nesting success was significantly higher when they nested in the year of, and the year after, 1080 operations, compared to when they nested more than a year after a 1080 operation (Figure 2).

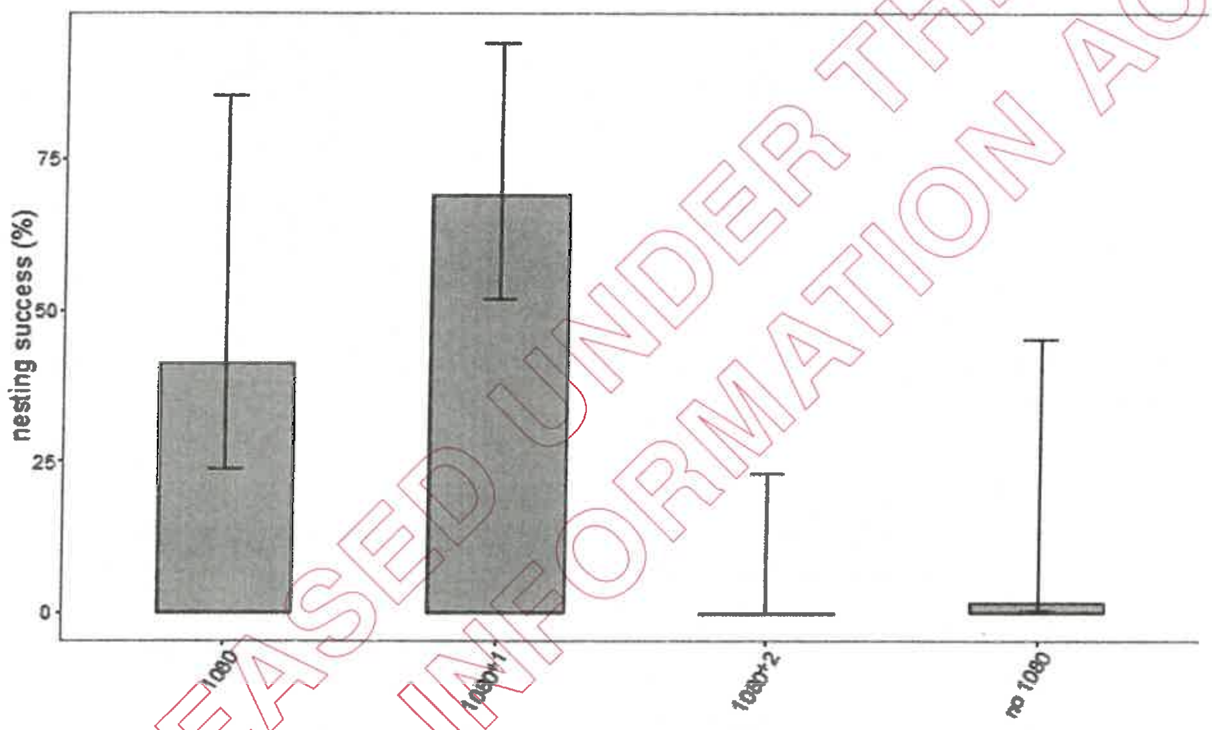


Figure 2: Nesting success of kaka in the year of a 1080 drop ("1080"), in the year after ("1080+1"), the year after that ("1080+2") and in a block not treated with 1080 ("no 1808").

42 kaka were monitored through the 5 1080 operations – none of them died.

68 kaka were monitored for longer periods - the survivorship was greater in the forests that were regularly treated with 1080 than in the forest that had not been treated with 1080 (Figure 3).

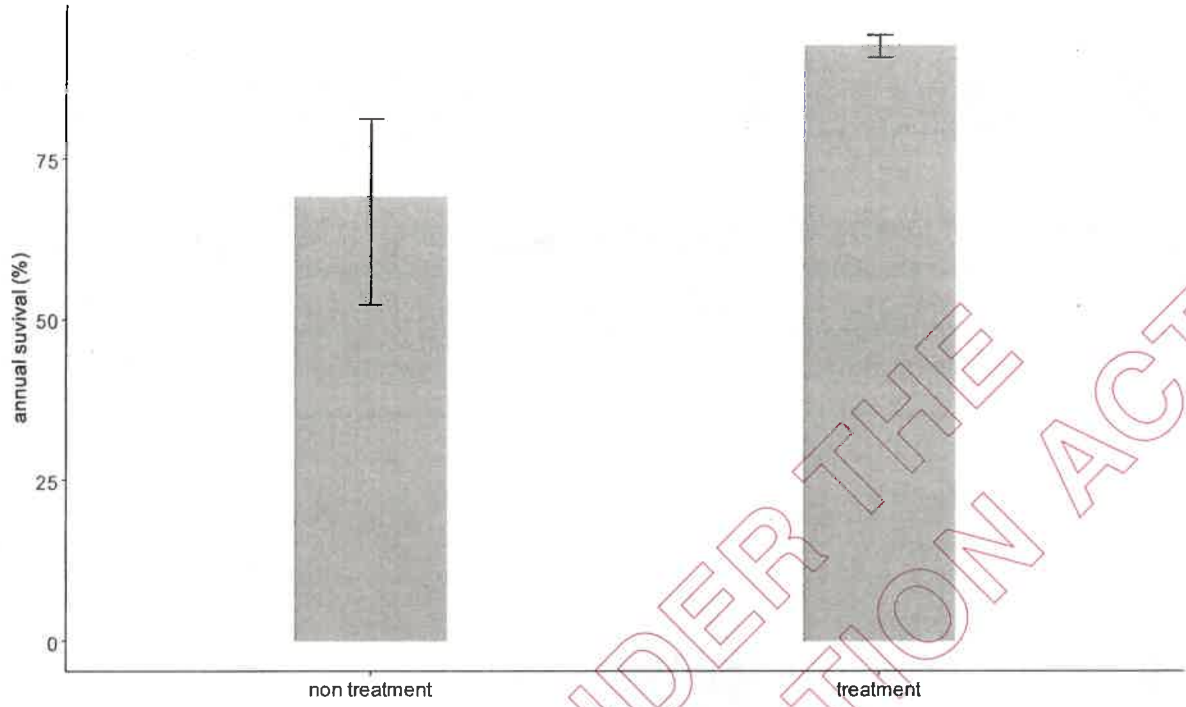


Figure 3: Kaka survival in areas not treated with 1080 ("non-treatment"), and areas treated with 1080 ("treatment").

Conclusions

- More than 100 kaka have been monitored through 1080 operations including those monitored in this study. None have been killed by 1080.
- Kaka survival in forests with 1080 treatment was better than in forests without.
- Kaka nesting success was higher when predators are controlled using 1080.
- In this study Kaka unequivocally benefitted from the use of 1080.