Department of Conservation
Te Papa Atawhai

17-E-366/ DOC 3151638

28 August 2017

[redacted]

OFFICIAL INFORMATION REQUEST

Thank you for your Official Information Act request to the Department of Conservation, dated 13 August 2017, in which you asked for the following information;

1. If kea have been killed in the 1080 drops this year what are the recorded known deaths following the drops.
2. How many drops of 1080 completed this calendar year have been followed up to check on fatality rates for native wildlife, how many were never followed up, and what are the documented fatality rates.
3. How does Doc measure the success or failure of each poisoning campaign.

To answer your questions;

1. No kea have been recorded as killed following aerial 1080 drops this year.

   However, I believe the intent of your question is to understand what is known about the effect of aerial 1080 operations on kea. DOC has studied this topic intensively. This included monitoring kea through 14 separate 1080 operations from 2008 to 2014. This study recorded 24 kea deaths during 6 of the operations. Unfortunately kea are at risk from all current predator control methods due to their inquisitive and opportunistic nature. This includes ground and aerial control methods, toxins and traps.

   Kea studies have also revealed the severe losses that are caused by predators. Uncontrolled stoat predation is the greatest threat to kea populations, particularly from nest predation during beech mast years. This means that kea are at more risk from predation than they are from predator control operations. This is because the benefit from controlling stoats (from improved nesting success) outweighs the loss of individual birds unintentionally killed by the predator control method, and far outweighs the losses that would occur if no predator control occurred at all.

   This work formed the basis of DOC's code of practice for aerial 1080 use in kea habitat. The code of practice aims to minimise kea deaths, while maximising the benefit from predator control. A copy of the code of practice is appended below for your information. It includes summaries of what is currently known about;

- Non-target risk to kea from aerial 1080 cereal operations
- Benefits to kea from predator control via aerial 1080
- Methods to prevent kea eating 1080 cereal baits

2. DOC has completed seven aerial 1080 drops to date this calendar year. Five of these included intensive monitoring of native wildlife. None of these recorded any deaths that were attributable to 1080 poisoning. The mortality that was recorded was primarily due to predation, particularly by rodents and mustelids.

3. The success or failure of each poisoning campaign is determined by two measures;
   a. The reduction in the number of predators at each site. Targets are specific to each operation, but typically include reducing rats to less than 3% tracking and stoats to undetectable levels following the 1080 drop.
   b. The increase in the number of threatened native wildlife. Targets are specific for each site, depending on what threatened species population is being protected at the site.

   Please see http://www.doc.govt.nz/our-work/battle-for-our-birds/ for more information on these targets, and a summary of results achieved through the 2016 Battle for our Birds campaign.

Yours sincerely

Peter Noble
Acting Director National Operations

Aerial 1080 in kea habitat

Code of Practice

This document has been written for Department of Conservation (DOC) staff. As a result, it includes DOC-specific terms and makes reference to internal documents that are only accessible to DOC staff. It is being made available to external groups and organisations to demonstrate departmental best practice. As these procedures have been prepared for the use of DOC staff, other users may require authorisation or caveats may apply. Any use by members of the public is at their own risk and DOC disclaims all liability in reference to any risk. For further information, please email sop@doc.govt.nz.

This Code of Practice was last reviewed on 2/06/2017

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Purpose and scope

Kea (*Nestor notabilis*) are nationally endangered and need protection from introduced pests to ensure their survival. Kea can also be vulnerable to pest management tools, including aerially applied 1080 baits. This Code of practice is designed to make best use of aerially applied 1080 for pest management whilst minimising impacts on kea populations long term.

The target audiences are Department of Conservation (DOC) staff and others managing aerial 1080 operations in kea habitat on land managed by DOC (Figure 1). This includes the following roles in the DOC Operational planning for animal pest operations SOP docdm-1488532 and the Processing applications for vertebrate pesticides and trapping SOP docdm-1490584:

Operational planner

Peer reviewer

Assessor

For more information on these roles see Key roles in animal pest planning docdm-1562274.

Effective from 1 February 2016, all applications for DOC permission to aerially apply 1080 in kea habitat must include an Assessment of Environmental Effects (AEE). This Code of practice should be read by all applicants to inform their assessment and management of risk.

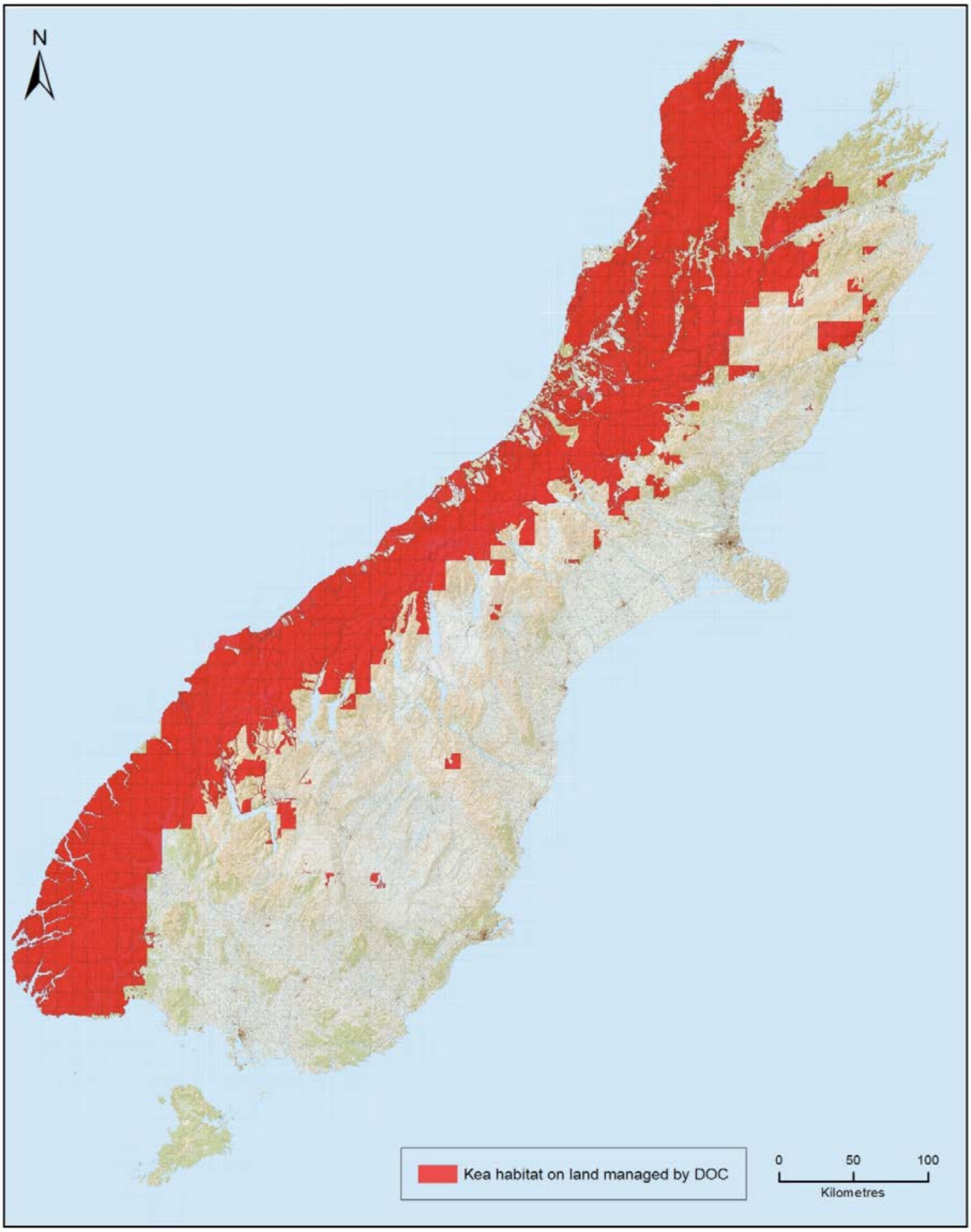
There are three main sections:

Section 2: Summary of research relevant to the risks and benefits of aerial 1080 in relation to kea conservation

Section 3: Compulsory performance standards applicable to all DOC permissions to use aerial and handlaid 1080 in kea habitat on land managed by DOC

Section 4: Guidance for operational planners, peer reviewers and assessors of aerial 1080 in kea habitat

This document supersedes Version 1.1, last updated on 10 October 2014.


N
Kea habitat on land managed by DOC
0
50
100
Kilometres


Policy
Standard Operating Procedure
Guideline

Figure 1: This document applies to aerial 1080 operations in kea habitat and on land managed by DOC, as defined by the map above. Information sources for the map include Robertson et al. (2007), the DOC kea database, DOC Bioweb, and the DOC Tier 1 monitoring programme.

DOC GIS: http://intmaps/richmapviewer/?Viewer=DOCgis&Project=c59a7d94-d568-495b-ab00-0016f8be2827

NATIS:
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DOC geoportal: http://geoportal.doc.govt.nz/geoportal/catalog/main/home.page
(Search on ‘kea’)

Summary of kea research

This section summarises research relevant to the risks and benefits of aerial 1080 in relation to kea conservation. Some of the kea-related research is still in progress and is cited as interim unpublished reports. Additional monitoring results or a change to the analysis methods could change our understanding of kea and predator dynamics.

Threat status of kea

Kea are nationally endangered, due to recruitment failure caused by predation at the nest and to pulses of increased predation of adults and juveniles during stoat irruptions.

The kea is a large mountain parrot, endemic to the South Island of New Zealand (Higgins 1999; Robertson et al. 2007). The kea is classified as 'Nationally Endangered' in the New Zealand Threat Classification system (Robertson et al. 2013). The criteria for this classification are a population estimate of 1000–5000 and an ongoing or predicted decline of 50–70% in the total population over the next 10 years, in this case due to recruitment failure.

An estimated 150000 kea were killed from about 1870–1970, with culling encouraged by a government bounty (Temple 1986). Kea gained partial protection (except where causing injury or damage to property) by law in 1970 and full protection in 1986 (Miskelly 2014). By 1993, DOC published a management guide for the protection of kea (Grant 1993). The management guide identified actions to conserve kea, particularly where their activities were causing problems in high country runs, ski fields and alpine villages, lowland areas and other human use sites. The lethal threats to kea include predation, lead poisoning, accidents with human objects, removal of nuisance individuals and poorly deployed pest control. A wide range of human activities indirectly threaten kea survival in the wild, however predation by introduced pests is driving the recruitment failure and the risk of extinction.

The kea is recognised as a taonga species, one of special cultural significance and importance to Ngāi Tahu, as acknowledged in the Ngāi Tahu Claims Settlement Act 1998. DOC and Te Rūnanga o Ngāi Tahu are committed to developing a recovery plan. Kea Conservation Trust and the Zoo, Aquarium Association and others are important parties in this discussion.

Kea productivity

Kea can be very productive in the absence of predators, but nests are vulnerable to predators.

Kea nest in rocky crevices, hollow logs and other natural cavities on the ground within forests (Jackson 1960, 1963; Elliot & Kemp 1999; Higgins 1999), except where no forest cover is available such as at Aoraki Mount Cook. Kea nests are usually widely spread over the landscape (Jackson 1960; Bond & Diamond 1992; Elliot & Kemp 1999). Kea have a long nesting cycle, with egg laying beginning in August and chicks fledging in December. Kea breed in most years, unlike other large New Zealand parrots, and successful breeders fledge between one and four chicks each season (Elliot & Kemp 1999; Higgins 1999). Mast seeding is the 'strongly variable seed production by a geographically definable population of plants' (Kelly 2008) and significantly increases seed availability. Working in beech and rimu forests in four National Parks over thirteen years, Kemp et al. (2015a) observed a slightly higher nesting rate in mast years than in non-mast years, suggesting that masts would be a time of higher than usual productivity were it not for predation.

Predators of kea

Stoats are the main predator, particularly in the year following masts.

The kea's ground-nesting habit and extended nesting cycle make it vulnerable to introduced mammalian predators, with stoats having the most impact. In a mast year (see Figure 2), a large quantity of seed is produced in summer and autumn and rodents become plentiful by the following spring. Stoats only breed once per year, in spring, with female stoats giving birth to up to 13 kits generally mid to late October in the South Island (King & Murphy 2005). Mortality of kits is usually high but during mast years most will survive, leading to recruitment into the population when juveniles leave the nest in mid to late summer. This surge in stoat numbers during the summer following mast seeding is known as a stoat irruption and corresponds with a very high failure rate for kea nests in the post-seedfall year. In a post-seedfall year without predator control, both nest survival and survival of adult and juvenile kea are low compared to the years between masts (Kemp 2015a, b).

Other predators have an impact, with nest cameras recording visits by stoats, possums, ship rats, house mice and weka. Stoats were identified as the predator in 3 of the 16 nest failures recorded (Kemp, unpublished data) and a possum was photographed at a kea nest dragging out a freshly killed kea chick (DOC website). Kemp (2015a) recovered and assessed the cause of death for twenty-five kea corpses. Fifteen of the deaths were caused by predation, with 5 killed by falcon, 8 killed by stoats and 3 killed by an unidentified predator (possibly also stoats).

Ship rats have little impact as predators of kea. Kemp et al. (2015b) observed a large drop in kea survival at an untreated site when stoats rose to peak levels during a rimu mast event, whereas nest survival remained moderate when rat tracking rates were also high.

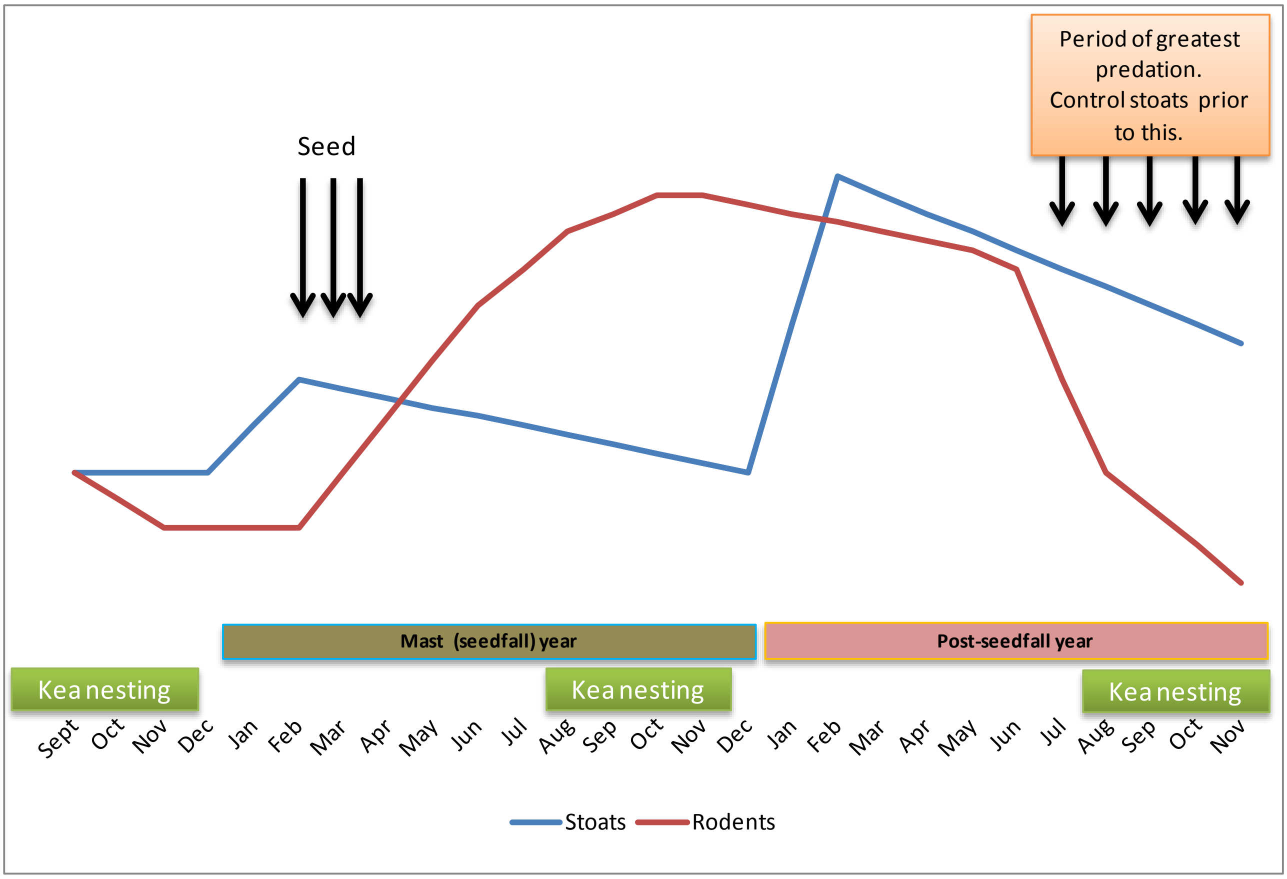

Figure 2: Illustration of how rodent and stoat tracking indices fluctuate during a beech or rimu mast (seedfall) year and in the post-seedfall year.

Non-target risk to kea from aerial 1080 cereal operations

There is some risk to kea from eating 1080 baits.

Kea survival has been monitored through fourteen aerial 1080 cereal operations since 2008 (Table 1). Kea were captured and tagged with VHF radio transmitters prior to the operation. The transmitters were fitted with motion sensors that record the time (hour) when motion ceased (Kemp et al. 2015c; van Klink & Crowell 2015). Of the 199 kea monitored, 24 kea died of 1080 poisoning, including 2 irrecoverable birds that are assumed to have been poisoned. The deaths all occurred at 6 of the 14 operations, suggesting that kea may be at risk of poisoning at some sites but not others. There are some theories on why some sites may be higher risk, such as habitat type or previous exposure to human objects and food. More research is needed to better understand the factors affecting kea poisoning risk and to differentiate between high risk and low risk sites.

The evidence suggests kea are poisoned directly by eating 1080 cereal baits, not by scavenging possum carcasses. Of the 24 poisoned kea, 13 died the day after 1080 baits were sown and 7 others died by the fifth day after sowing. All except two of the poisoned kea were autopsied and bright green contents were found in the digestive system, indicating that green-dyed 1080 cereal bait had been consumed.

Operation	Number of birds tracked	Deaths recorded	Probability of survival	95% confidence interval
Arawhata 2008	10	0	100%	74.1–100%
Fox-Franz Josef 2008	17	7	58.8%	32.9–81.6%
Mt Arthur 2009	13	0	100%	79.4–100%
Hawdon 2009	10	0	100%	74.1–100%
Okarito 2011	37	8	78.4%	61.8–90.2%
Wangapeka 2011	13	0	100%	79.4–100%
Abbey Rocks 2011	8	0	100%	68.8–100%
Copland 2012	2	0	100%	22.4–100%
Hawdon 2012	6	0	100%	60.7–100%
Otira 2013	34	5	85.3%	68.9–95%
Abbey Rocks 2014	21	1	95.2%	76.2–99.9%
Hawdon Andrews 2014	4	0	100%	47.3–100%
Kahurangi 2014*	22	2	90.9%	70.8–98.9%
Rotoiti 2014	2	1	50%	1.2%–98.7%
TOTAL	199	24	–	–

Table 1: Sample size and outcomes for kea with monitored via radio telemetry before and after aerial 1080 cereal operations (adapted from Kemp et al. 2015c). The number of birds tracked refers to the number of radio tagged kea confirmed in the treatment area at the time when 1080 was applied. Deaths were recorded by regular telemetry surveys after the aerial 1080 operation and searches for any transmitting a mortality signal. *Kahurangi was a very large operation and occurred as four separate 1080 drops.

Benefits to kea from predator control via aerial 1080

Bykill of stoats from aerial 1080 operations targeting rodents and possums during mast years is the best tool currently available to protect kea from stoat irruptions.

Stoat biology and kea nesting density mean that predator control needs to take place on a landscape scale for effective protection. Kea breeding pairs and nests are found at a low density so broad scale control is needed to cover even a small number of nests (Jackson 1960; Bond & Diamond 1992; Elliot & Kemp 1999). Stoats have a large home range and dispersing young are capable of long distance travel (Murphy & Dowding 1994; King & Murphy 2005), so localised small scale control measures are quickly undone by immigration unless continuously applied. We have learned from our experience protecting other stoat vulnerable threatened species such as kiwi that an extensive area must be controlled to give adequate protection e.g., Okarito kiwi (Miller et al. 2001). Methods must target both female and male stoats to achieve effective control.

Aerial 1080 is the main method for rat and possum control over large remote areas and can be effective for reducing stoat numbers through secondary poisoning (Brown et al. 2015). Murphy et al. (1999) first recorded a reduction in a stoat population following aerial 1080; they observed prey remains in 12 of 13 radio-tracked stoat corpses after the operation including rat remains in 8 corpses and possum remains in a single corpse.

Both rats and mice are effective poison vectors for stoats in aerial 1080 cereal operations. This has been accepted for rats for some time, based on consistent rat kills at pre-fed aerial 1080 cereal operations (Fairweather et al. 2015) and their common occurrence in the stoat diet (King & Murphy 2005). In the Tongariro Forest (podocarp/broadleaf forest), where rats are abundant (>60% tracking rates), stoats tracking rates have been reduced to 0% after 1080 operations (Guillotel et al. 2014).

Mouse kills at pre-fed aerial 1080 cereal operations are more variable (Fairweather et al. 2015; Kemp 2015). Until the Battle for our Birds program was monitored in 2014, it was less certain how well stoats would be suppressed in a mast in the absence of rats. Kemp (2015) compared rat and mouse monitoring results at 22 aerial 1080 operations in mid to late 2014 with the stoat tracking in summer 2015 at treated and untreated sites. Strong stoat reductions were observed where either rats or mice were moderately abundant before the operation and very low afterward. Stoat tracking levels remained high when the operation failed to reduce rats and mice to low levels, leaving healthy rodents in the system (Kemp 2015).

Kea productivity is very low during uncontrolled stoat irruptions. Kea productivity and survival were monitored at a controlled study with a non-treatment area for a lowland rimu forest in Westland (Kemp et al. 2015b, Figure 3) and at several beech forested site in Kahurangi, Nelson Lakes, and Arthurs Pass National Parks (Kemp et al. 2015a). In all studies, nest survival was very poor (< 10%) in the year after the mast (called the post-seedfall year, Figure 2) without predator control, whereas nest survival was very high (>70%) when predators were controlled to low levels, including in the post-seedfall year where predators had been controlled with aerial 1080 during the mast. Without the use of aerial 1080, the increase in stoats in the post-seedfall year can strongly impact on kea survival and ability to raise young.

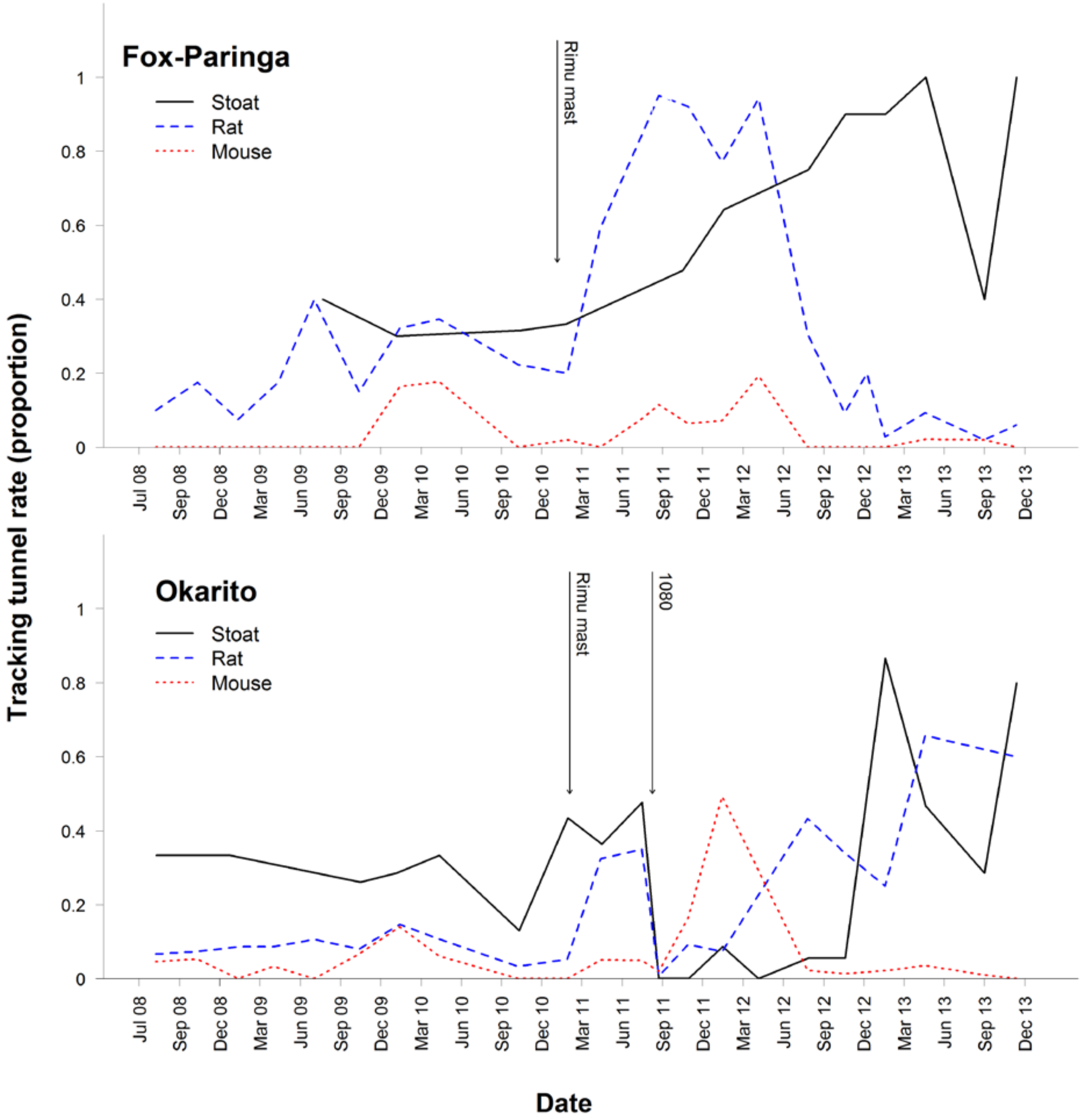

Figure 3: Relative abundance of stoats, rats and mice in a rimu mast year (2011), in the post-seedfall year (2012), and in the following year (2013). An aerial 1080 cereal operation occurred at Okarito whereas Fox-Paringa received no predator control.

Methods to prevent kea eating 1080 cereal baits

There are things we can do to reduce bait take by kea, in aerial 1080 operations and in managing other human interactions with kea. Repellents are not available for operational use.

DOC introduced a mandatory baiting protocol in 2010 for kea habitat on public conservation land (refer to Section 3 for current standards). This restricted the bait type to the RS5 cereal formulation with cinnamon lure. The RS5 cereal formulation was selected because it was less palatable to captive kea than the Wanganui #7 formulation in two different aviary trials (Luey 2009; Blyth 2011). Cinnamon lure is commonly used in both prefeed (typically 0.15% wt/wt) and toxic baits (typically 0.30% wt/wt), mainly to mask the odour and taste of 1080 to possums (Morgan 1990) and also for its possible deterrence of birds. All operations monitored for kea survival have used cinnamon lure. We don't know how other lures would affect bait attractiveness to kea or other non-target species.

The baiting protocol also includes a maximum sowing rate for prefeed and toxic baits to limit kea encounters with baits. Sowing rates are limited by a range of factors including cost, and most operations reach their targets under the 2010 maximum rates of 2 kg/ha for 12 g baits and 1 kg/ha for 6 g baits. However, sometimes during mast events rodent populations can reach extreme densities which require higher sowing rates to be applied to achieve adequate control of stoats (see Section 2.7). For this reason, the maximum has been set to allow flexibility for unusually high target pest densities and to avoid the situation where toxic baits are applied without reducing rodents and stoats sufficiently.

Even outside of pest control, there is merit to reducing kea interactions with human objects as a means to reduce both their exposure to lethal hazards and their future interest in cereal baits. The Kea Conservation Trust website keaconservation.co.nz has more information, including four important steps for the general public to support kea safety:

Don't feed kea ever

Watch out and slow down [when driving] for kea

Put your gear away and clean up your rubbish

Close your doors

This could be extended to how buildings, structures and car parks are managed, for example using best practice rubbish bins at car parks and minimising building debris at construction sites. DOC's kea field workers report an apparent behavioural difference among kea in remote sites compared to kea in mountains near ski fields and other tourist sites, with more bold behaviour toward people near tourist areas (J. Kemp, pers. comm.). Kea may be more at risk of sampling baits if they have a history of interacting with human objects and food. Taking steps to reduce kea interactions with human objects could reduce a bird's future risk of poisoning.

An effective repellent would strengthen the strategy to reduce kea deaths, by deterring kea from eating toxic baits. Several organisations have worked together on trials to develop an effective bird repellent to protect kea at aerial 1080 cereal operations, focusing on d-pulegone (which has a strong minty odour disliked by birds) and anthraquinone (which birds learn to avoid after post-ingestional discomfort). Kea consumption of cereal baits was reduced when these repellents were used in an aviary study in 2009 (Orr-Walker et al. 2012). Since then, limitations have been identified for the use these repellents at the tested concentrations. Anthraquinone seems to be disliked by rats, resulting in reduced cereal bait consumption (Cowan et al. 2015) and compromised field efficacy (Crowell et al. 2016b). Much of the d-pulegone was lost during bait manufacture and further loss occurred during storage (Crowell et al. 2016a). Dissipation of d-pulegone affected an aerial 1080 operation where prefeed and 1080 cereal baits were manufactured with d-pulegone and 14.7% of monitored kea died (van Klink & Crowell 2015). Improved manufacturing methods would be needed to control the release of d-pulegone. The funded research program is presently ceased while more options are evaluated. Next steps for progressing repellents were identified and other repellents have been recommended for further investigation (Cowan et al. 2016). While an effective repellent would prevent kea deaths at aerial 1080 operations, we still need to reduce stoat predation in order to reverse the decline of this species.

Operational timing to prevent a stoat irruption

When timed for a mast or post-seedfall year, aerial 1080 is highly likely to prevent the high rates of stoat predation on nests and adults that would otherwise occur. At other times, it is less certain whether the level of stoat bykill is high enough to offset potential kea losses.

Operational timing and scale are critical to prevent predation of kea and destruction of their nests by stoats, to compensate for any potential kea poisoning. To recap:

- Masts would be a time of high kea productivity and survival were it not for predation by stoats (Section 2.2).
- Uncontrolled stoat irruptions are the most likely root cause of the decline of the species, due to the associated high rates of nest failure and kea predation (Sections 2.3).
- Rodents must be reduced to low levels at a large scale to achieve a strong stoat reduction. When aerial 1080 is timed to prevent the stoat irruption that follows a forest mast, there is evidence that kea nesting and survival improve relative to an untreated site (Section 2.5).
- The impact of stoat predation on kea is less between stoat irruptions. Stoat bykill is still highly likely for large operations that reduce rodents to low levels. If kea are poisoned, we do not know whether the benefit to kea nesting and survival of the stoat bykill is high enough to offset the impact of those deaths relative to an untreated site in the period between masts.

For this reason, different performance standards are applied to aerial 1080 cereal operations depending on the timing of toxic bait application (Section 3.1). The timing set out in performance standard 4 is optimal for preventing or controlling a stoat irruption. Performance standard 5 applies to bait application early in a mast year, when a stoat irruption can be prevented so long as rodents are widespread and subsequently reduced by aerial 1080.

Outside of the periods specified in performance standards 4 and 5, we are uncertain whether aerial 1080 cereal operations will improve kea productivity enough to compensate for potential kea deaths. Operations with this timing must be designed to monitor target pest reductions and stoat bykill under performance standard 6, to contribute to a future review of the performance standards.

Compulsory performance standards in kea habitat

This section states the compulsory performance standards that apply to the aerial application of 1080 within kea habitat (Figure 1) on land managed by DOC.

Section 3:1 Aerially applied 1.5 g/kg 1080 pellets (pesticide use #1 0.15% 1080 Pellets and pesticide use #140 Pestex on the DOC Status List)

Section 3.2: Aerially applied 0.08% 1080 Pellets or 0.08% 1080 Rodent Pellets (pesticide uses #7 and #10)

Section 3.3: Aerially applied 0.2% 1080 Pellets (targeting wallabies, pesticide use #22) or 0.04% 1080 Pellets (targeting rabbits, pesticide use #14) and aerially applied 1080 carrot (pesticide uses #25, 30 and 33)

Aerially applied 1.5 g/kg 1080 pellets

Standards 1, 2, and 3 always apply. One of standards 4, 5 and 6 will apply to an operation, depending on the timing of bait application. Figure 4 illustrates the time periods when standard 4 (blue), standard 5 (yellow) and standard 6 (purple) apply. A coordinated annual process provides a mast determination for forest and tussock sites by November for the following year, as outlined in Section 3.1.1. Where operations cannot comply with the performance standard that applies to its planned timing, an exemption can be requested following the process in Section 3.1.2.

Compulsory performance standards for aerially applied 1.5 g/kg 1080 pellets	
1	**Bait type:** Only use cinnamon-lured RS5 prefeed and toxic baits.
2	**Prefeed sowing rates:** Use a maximum of 4 kg/ha of prefeed bait for 12 g baits (or 2 kg/ha for 6 g baits, nominal sowing rates).
3	**Toxic sowing rates:** Use a maximum of 4 kg/ha of toxic bait for 12 g baits (or 2 kg/ha for 6 g baits, nominal sowing rates).
4	**Timing in mast and post-seedfall years (Figure 4, blue):** When forest or tussock is in a mast (seedfall) year or in the post-seedfall year (as determined by DOC), toxic bait application can occur in the 14 month period between 1 July in the seedfall year and 31 August in the post-seedfall year.
5	**Timing early in a mast year (Figure 4, yellow):** If toxic bait application is planned for between 1 May and 30 June in a mast (seedfall) year, pre-operational monitoring of rodents must take place between February and May inclusive. In order for toxic bait application to occur prior to 1 July, the average tracking index for rodents (rats, mice or both combined) must be at least 10% for transects located according to Gillies and Williams (2013).

6	**Information need for timing between masts (Figure 4, purple):** At other times (i.e. prior to 1 May in the seedfall year or after 31 August in the post-seedfall year), monitoring of changes in pest abundance must take place. Monitoring must: -Be designed to represent the whole operational area -Produce a relative abundance index for rats and mice following Gillies and Williams (2013), both pre- and post-control -Produce a relative abundance index of stoats both pre- and post-control, designed in consultation with a Science Advisor Threats (e.g. using tracking tunnels or cameras) -Produce a relative abundance index for possums following the applicable National Pest Control Agencies protocol, both pre- and post-control -Ideally include a monitored non-treatment area If initial control was successful, DOC may continue post-control monitoring for an additional 2–3 years pending advice from a Science Advisor Threats. The monitoring report and raw data must be supplied to DOC within 6 months of bait application.

Table 2: List of compulsory performance standards that apply to aerially applied 1.5 g/kg 1080 pellets on land managed by DOC.

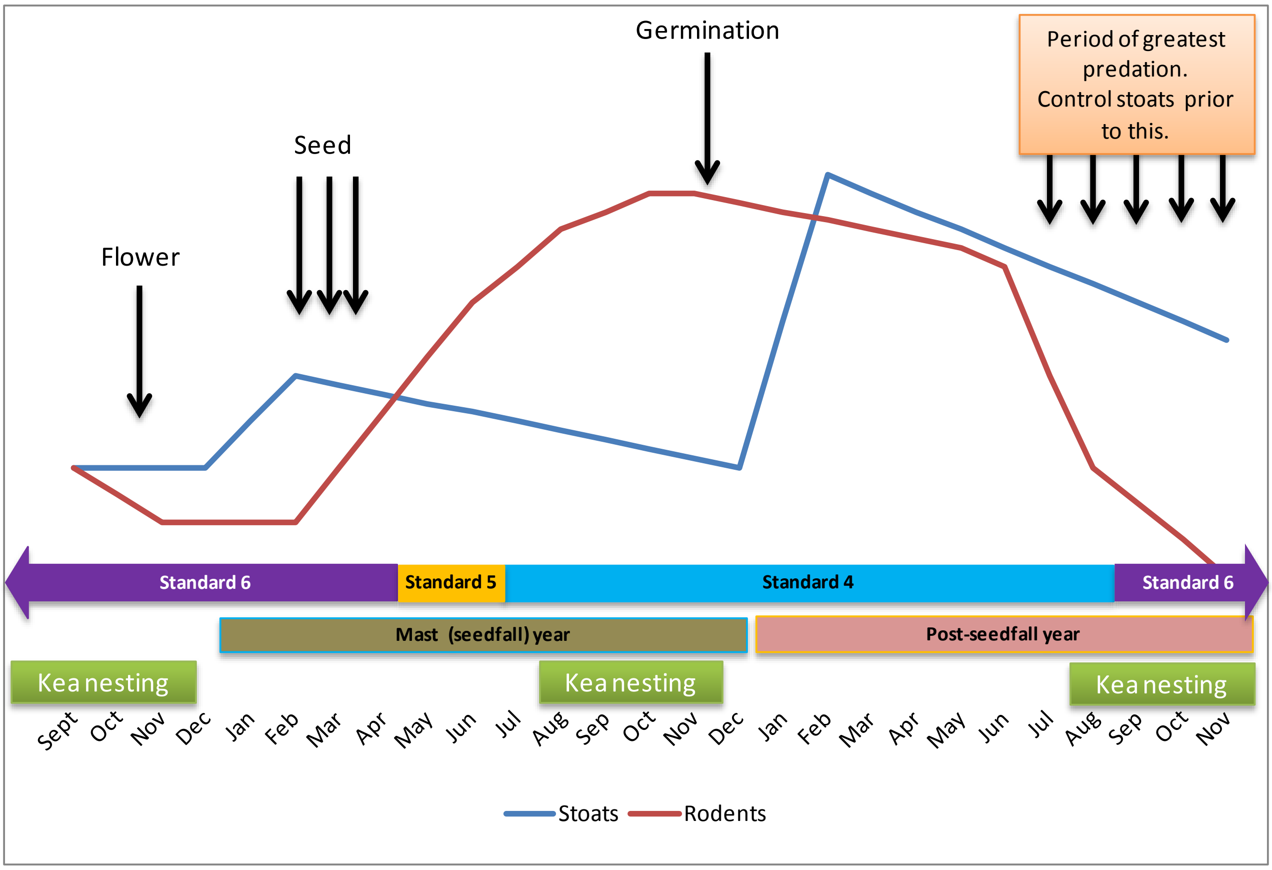

Figure 4: Illustration of the timing of performance standards 4 and 5, as compared to rodent and stoat tracking indices fluctuate during a beech or rimu mast (seedfall) year and in the post-seedfall year.

Handlaid 1.5 g/kg 1080 pellets

Where handlaying is used in conjunction with aerial application, performance standards 1–6 apply to the handlaid blocks.

For operations that are entirely handlaid, performance standards 1–6 are recommended. The application of these standards is at the discretion of the DOC manager who decides on the DOC permission for the operation.

3.1.1 Process for determining whether a planned operation is in a mast or post-seedfall year

The application of compulsory performance standards 4, 5 or 6 (Table 2) depends on whether forest at the operational area is considered by DOC to be in a mast (seedfall) or post-seedfall year. This section explains the process by which this is determined for operations that include beech- or rimu-dominated forest. For operations without significant forest habitat, the application for DOC permission must be considered as an exemption following the process in Section 3.1.2.

Step 1	**March (year before a proposed operation)** Beech-dominated forests: Technical Advisor Threats requests climate modelling prediction from Science Advisor Threats for beech forest in the following calendar year. Rimu-dominated forests: No advice is available until Step 2.
Step 2	**November** Technical Advisor Threats compiles aerial 1080 cereal operations planned by DOC and OSPRI for the following calendar year. Science Advisor Threats assigns a mast likelihood based on climate modelling prediction (beech forest only) and available flowering observations (beech and rimu): Highly likely to mast—no monitoring required Not going to mast—no monitoring required Post-seedfall year—no monitoring required Beech or rimu shooting required to confirm masting For the operations where no monitoring is required, Technical Advisor Threats advises managers of the mast likelihood. For the operations requiring further monitoring, Science Advisor Threats identifies appropriate monitoring sites. Technical Advisor Threats requests support from Operations Managers for beech and rimu shooting.
Step 3	**December to second week in February** Rimu shooting can occur at any time before mid-February, following a method to be developed in 2016. The recommended timing for beech shooting and analysis is the second week of February, following the method in the Report on beech seed sampling by shotgun doc-2576177. Rangers report the monitoring outcomes to the Technical Advisor Threats and the relevant manager.
Step 4	**End of February** Technical Advisor Threats to collate and communicates to DOC and OSPRI managers. For operations that are not going to mast, managers decide whether to carry out the monitoring required by performance standard 6, delay the

	operation, or apply for an exemption to performance standards 4, 5 and 6.

3.1.2 Exemption process for compulsory performance standards

Applicants for DOC permission can seek an exemption from one or more compulsory performance standards. Exemptions are assessed as part of the Processing applications for vertebrate pesticides and trapping SOP docdm-1490584 and are decided by the approving DOC manager. The exemption process is below.

Step 1	**Before applying for DOC permission** The applicant discusses their proposed application with the DOC assessor (person who will assess the application) before applying for DOC permission. For performance standards 4 and 5 (Table 2), the DOC assessor must be a Technical Advisor (Threats).
Step 2	**Making an application for DOC permission** The applicant explains the reason why the performance standard should be waived in their application for DOC permission (Section 5, Further information), including their assessment of the five bullet points below.

Step 3	**Assessment of application for DOC permission** The assessor evaluates their request and makes a recommendation to the DOC manager in the application assessment report, including specialist advice and accounting for the following site information: Potential number of kea and kea nests Pest population indices (possum, stoat, rat, mouse) Any other stoat control planned or in place Any early indications of upcoming mast seeding Type of habitat (in native forest kea are more likely to be consistently present than in high country grasslands or pine forests)
Step 4	**Decision on application for DOC permission** The DOC manager considers the recommendation and decides on the DOC permission. The DOC manager is accountable for the decision to exempt the operation from one or more compulsory performance standards.

Aerially applied 0.08% 1080 Pellets or 0.08% 1080 Rodent Pellets

Compulsory restriction

Aerial application of 0.08% 1080 Pellets and 0.08% 1080 Rodent Pellets is prohibited.

These products are only available in the Wanganui #7 cereal formulation. This formulation was preferred by captive kea over RS5 cereal pellets in two aviary trials (Luey 2009; Blyth 2011). The exemption process in Section 3.1.2 must also be followed for applications for DOC permission that do not comply with this compulsory restriction.

Handlaid 0.08% 1080 Pellets or 0.08% Rodent Pellets

It is recommended that 0.08% 1080 Pellets and 0.08% 1080 Rodent Pellets are not handlaid.

Aerially applied 0.2% 1080 Pellets, 0.04% 1080 Pellets, or 1080 carrot

Compulsory information need

Any aerial application of 0.02% 1080 Pellets, 0.04% 1080 Pellets, or 1080 carrot must be monitored for kea survival, with support from DOC Science & Policy and following Kemp et al. (2015c) or van Klink & Crowell (2015).

The exemption process in Section 3.1.2 must also be followed for applications for DOC permission that do not comply with this compulsory information need.

No aerial 1080 operations using these cereal baits have been monitored for kea survival so the risk is unknown. The cereal baits use to target wallabies (0.2%) and rabbits (0.04%) are different from either the RS5 or Wanganui #7 cereal formulations and neither is lured with cinnamon.

Two kea were monitored and survived in one aerial 1080 0.08% 1080 carrot operation in 2007 (Kemp, unpublished data). This method is seldom used in kea habitat, but any future operations need to be monitored to help quantify the risk to kea. Carrot is eaten by captive kea and may be attractive to wild kea.

Kea monitoring requires specialist skills, involving capture of kea (ideally more than 10) and tagging them with VHF radio transmitters weeks or months before poison baiting. Telemetry surveys are carried out during the risk period following the operation, on foot and from aircraft.

Handlaid 0.2% 1080 Pellets, 0.04% 1080 Pellets, or 1080 carrot

It is recommended that kea survival is monitored for any operation where 0.2% Pellets, 0.04% 1080 Pellets, and 1080 carrot are handlaid.

Operational planning in kea habitat

Operational planning of aerial 1080 includes the management of risk to non-target species, at the following steps in the DOC Operational planning for animal pest operations SOP docdm-1488532:

- Preparing phase step 7 Assessing possible pesticide uses on the Status List
- Planning phase step 3 Plan operational details and arrange review
- Planning phase step 4 Prepare draft DOC application form, including map and an AEE
- Pre-operational phase step 1 Revise all planning documents to respond to consultation and peer review
- Pre-operational phase step 2 Obtain consents and update operational plan

DOC assessors make recommendations to the approving manager on the performance standards that should be applied to DOC permissions in the DOC Processing applications for vertebrate pesticides and trapping SOP docdm-1490584.

This section suggests factors for operational planners, peer reviewers and assessors to consider when identifying risks and performance standards for aerial 1080 operations in kea habitat.

Kea and your site

4.1.1 Significance of kea at your site

The shapefile associated with the map of kea habitat in Figure 1 is based on Robertson et al. (2007) and kea observation records in the DOC kea database. This shapefile determines where the DOC Code of practice for aerial 1080 in kea habitat (this document) applies.

There may be more information on where and how many kea are present at your site. Local people may have records or reports that included kea observations, including DOC staff, the rūnanga, conservation groups, neighbours and ski fields.

If you think that areas should be added or removed from the map of kea habitat in Figure 1, gather your evidence to support this and contact Josh Kemp (jkemp@doc.govt.nz).

Section 4.2 and 4.3 suggest some additional performance standards that could be applied where kea are present in large numbers or where kea deaths were recorded in previous operations.

Sources of further advice on evaluating the significance of the kea population at your site include the local rūnanga, DOC specialists (Josh Kemp jkemp@doc.govt.nz, Graeme Elliot gelliot@doc.govt.nz, Andy Grant agrant@doc.govt.nz), and the Kea Conservation Trust (info@keaconservation.org.nz).

4.1.2 Kea ecology and behaviour

Understanding the behaviour and ecology of non-target species is important for managing the risks effectively. The research summary (Section 2) is a good start point for operational planners, peer reviewers and assessors. Specific points can be followed up by reading the original report (Section 5). Unpublished reports are available from the report author or Michelle Crowell (mcrowell@doc.govt.nz). The DOC website www.doc.govt.nz provides additional information and is good for sharing information with others.

Reducing the risk of kea deaths at your site

Compulsory performance standards 1–3 (Section 3.1) are designed to reduce the likelihood of kea sampling toxic bait. These kea-specific standards are part of a wider context of legal and risk-based performance standards that reduce the poisoning risk for non-target native species in aerial 1080 operations, such as colour specifications for toxic baits.

Other measures to protect kea have been identified but have not been proven. Such measures could be developed through field trials with adequate design and reporting, for example:

The operation must be part of a bird repellent trial and monitored for kea survival, with support from DOC Science & Policy and following Kemp et al. (2015c) or van Klink & Crowell (2015).

The operation must be part of a trial or research on [specify new methods] to protect kea, with advice from DOC Science & Policy. The operation must be monitored for kea survival, with support from DOC Science & Policy and following Kemp et al. (2015c) or van Klink & Crowell (2015).

Reducing stoat predation of kea

4.3.1 Stoat bykill from aerial 1080 operations

Compulsory performance standards 4–5 are designed to time operations to prevent or control the stoat irruption that follows a forest mast. Other aspects of control design will influence the level of stoat control achieved. Stoat control must be at a landscape scale to be effective, ideally with boundaries that minimise short-term reinvasion by stoats.

4.3.2 Supplementing aerial 1080 with other stoat control tools

Stoats can be controlled with traps or para-aminopropiophenone (PAPP) in bait stations, to protect kea from predation and offset potential kea deaths in aerial 1080 operations. The control design is critical for achieving stoat control, for example:

Stoat control must be at a landscape scale to be effective, ideally with boundaries that minimise short-term reinvasion by stoats.

The DOC current agreed best practice includes a method best practice for kill trapping of stoats, which includes points relevant for both trapping and bait stations for stoat control.

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Amendments

Date	Amendment details	Version	Amended by
1/2/2016	Version 2	2.0	Crowell
2/6/2017	Minor amendments to include new 1080 cereal pellet product (Pestex)	2.1	Weldon