



*The science behind the  
Department of Conservation's  
beech mast response and  
predator control*



Orange-fronted parakeet, Photo: Sabine Bernert



Department of  
Conservation  
*Te Papa Atawhai*



Department of Conservation (DOC) scientist *Graeme Elliott* discusses the current beech mast, an event that will mean high numbers of predators putting pressure on our vulnerable native birds. Here are the facts about DOC's beech mast response – the Battle for Our Birds.



## WHAT IS A BEECH MAST?

**B**eech trees flower and produce large quantities of seed only once every 2 to 6 years – this is a mast year. Masts are triggered by a summer that is warmer than the previous one and by tracking temperatures we can predict when this will occur.

Beech seed provides good food for rats and mice, which are in turn good food for stoats. During mast years rats, mice and stoats breed prolifically on the abundant food and the increased number of rats and stoats prey on native birds such as mohua, kākā, kea, whio and kiwi along with other species at risk like bats and land snails.

A widespread beech mast is happening now and without help many native species will suffer dramatic declines over the next year.

*Graeme has been involved in research on protecting forest birds from predators for most of his career. His PhD on mohua in Fiordland's Eglinton Valley during the 1980s confirmed fears they were taking a hammering from stoats every time there was a beech mast. Similar results for yellow-crowned parakeets and kea have prompted his advisory role to a number of pest response and recovery programmes. He is currently focused on trying to control rats, stoats and possums on large scales in order to protect a range of native forests birds in the backcountry.*



## Beech trees in New Zealand

*There are five species of beech found in New Zealand. You can tell all five apart by their leaves and growth forms, and each prefers different soil and climate conditions.*

- A bit less than **1/4 of NZ** is still covered in native forest: (6.4 million ha)
- Of these forests, about **2/3 have some** beech in them: (4 million ha)
- About **1/2 of these** have almost **nothing but beech** trees (2 million ha)

Beech trees can produce millions of seeds, and during a heavy seed fall about 50 million seeds (about 250 kg of seeds) will fall per hectare.



*Hard beech*



*Mountain beech*



*Red beech*



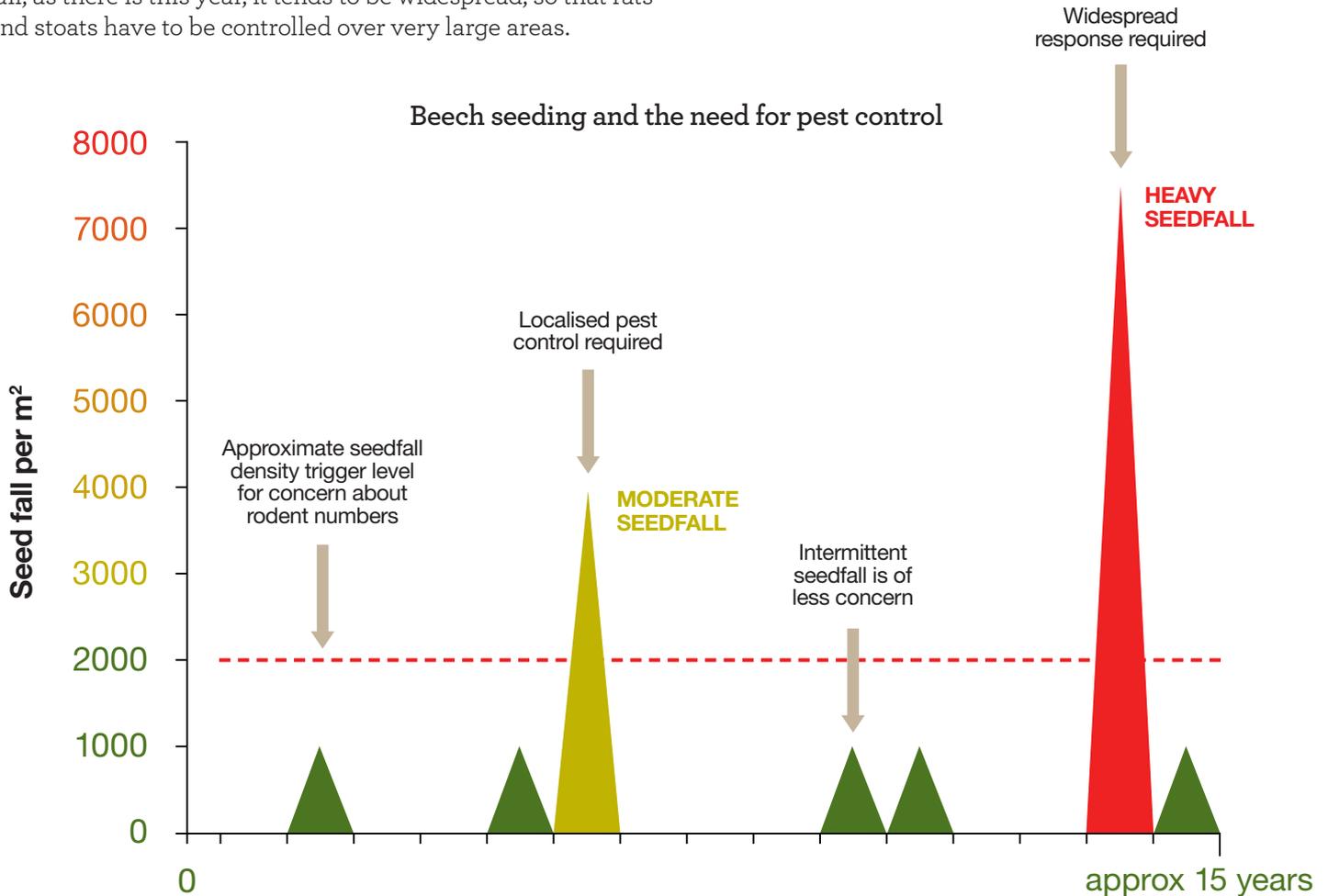
*Silver beech*



*Black beech*

# BEECH SEED: A NATURAL EVENT HIJACKED BY INTRODUCED PESTS

In beech forests in years when there is no mast, many native birds can tolerate the low levels of rats and stoats present and little or no pest control is necessary. During years when beech mast occurs at just a few sites, localised pest control will do the trick. When there is a large beech mast with heavy seed fall, as there is this year, it tends to be widespread, so that rats and stoats have to be controlled over very large areas.



## *Beech flowering in spring*



## *Seed falls in autumn*



*Rodent numbers build up during winter and stoat numbers during the summer*

# WHY THE BIRDS NEED OUR HELP

The irruption (rapid expansion) of the rat population is disastrous for small forest birds, like mohua.

In the years when stoats and rats are abundant, mohua breeding is very unsuccessful, and if it's a really big rat plague (which is how this year is turning out), their populations take a huge hit – probably 80–90% of birds are killed.

Hole- or ground-nesting larger birds like kiwi, kākā and whio, are highly susceptible to stoat predation. In an exceptional mast year when rats and stoats are at plague proportions, these birds are often caught on the nest by stoats and if the adults are not killed, the eggs or chicks are easy prey.

## Stoat-sensitive birds

are larger birds that are too big for rats but are killed by stoats. These include:



Kiwi



Kākā



Whio/blue duck

## Stoat- and rat-sensitive birds

are all the smaller birds that both rats and stoats can eat. There are many of these species, including:



Mohua/  
yellowhead



Titipounamu/  
rifleman



Toutouwai/  
robin



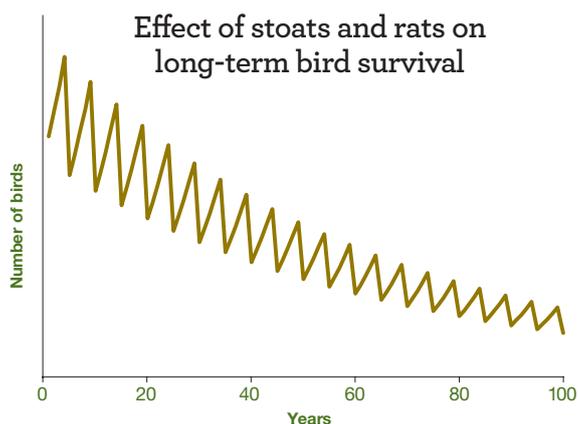
Orange-fronted  
kākāriki



Korimako/  
bellbird

## Stoats are bad...

After a stoat plague, the birds recover relatively quickly until the next one, but over a longer period of time there is a steady decline.



## ...but the combination of stoats and rats is catastrophic



There is a much larger impact on smaller birds when both rat and stoat plagues happen so the populations decline more quickly.

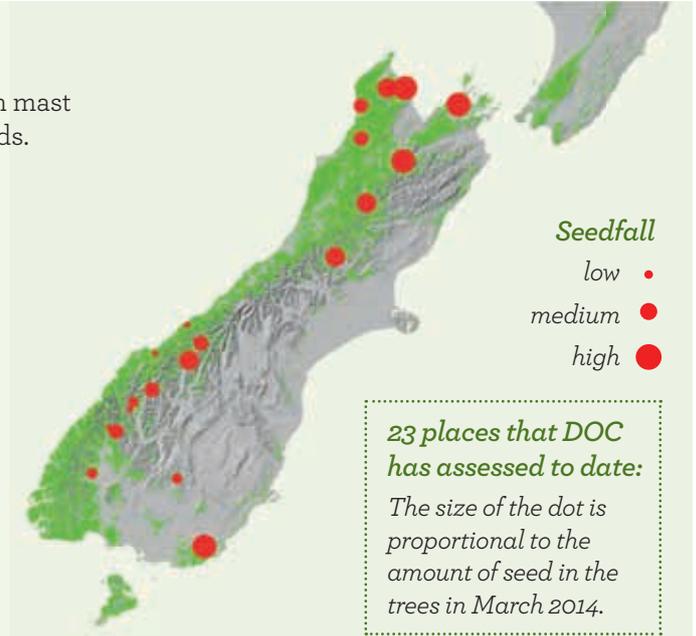
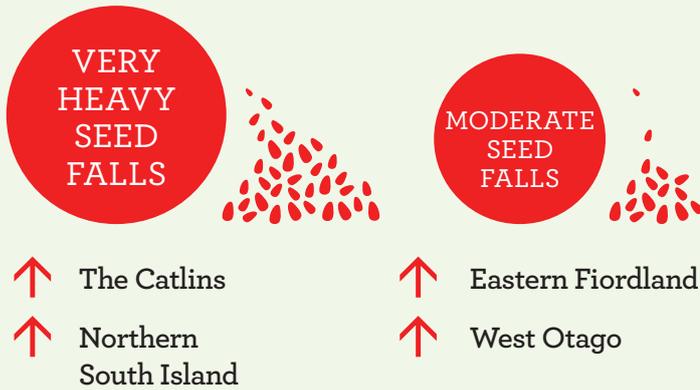
Well timed and planned operations of aerial 1080 is DOC's best chance of protecting our birds from this fate.

# WHAT DOC IS DOING ABOUT IT

## 1 Confirming the beech mast

First, DOC has confirmed the prediction of a beech mast by shooting beech tree branches and counting seeds.

*The verdict:*



## 2

### Measuring predator numbers

By late May, rodent and stoat abundances were measured through our extensive tracking lines.



## 3

### Predator control

The 'Battle for our Birds' predator control programme is essentially an extension of current pest control happening in South Island forests. More extensive aerial applications of biodegradable 1080 pesticide and a boost to ground-based trapping networks is planned to ensure predator numbers of plague proportions do not eventuate. This is especially important for New Zealand's native bird species, which are most vulnerable during beech mast years when nesting.

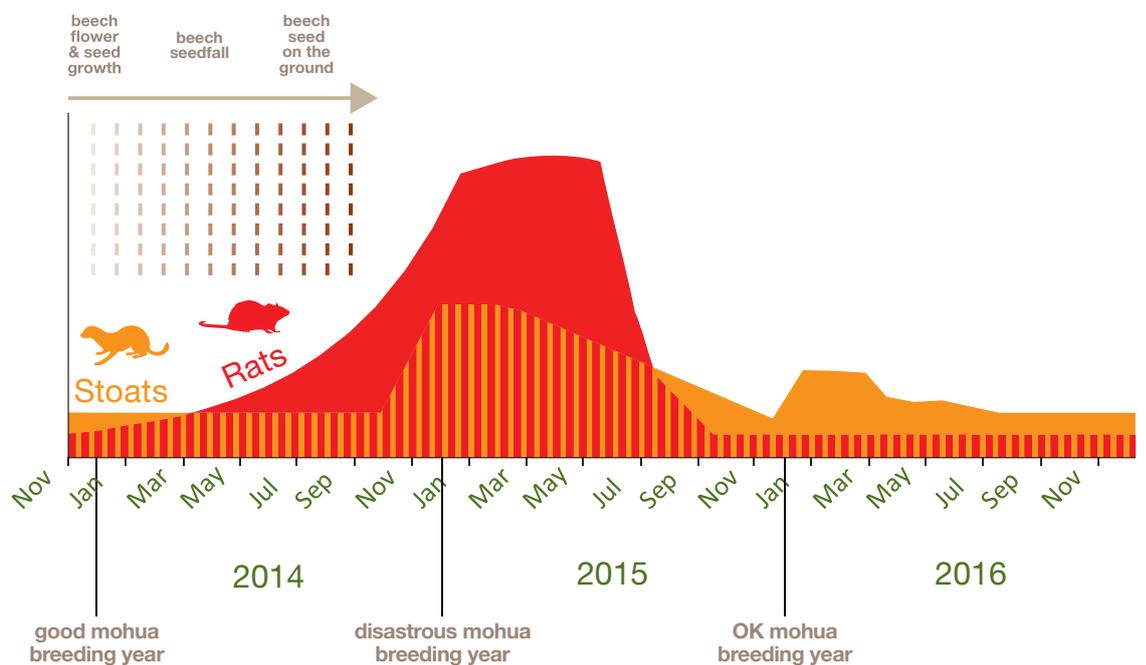
# HOW 1080 CAN REDUCE PLAGUE PREDATOR NUMBERS

The main tool for Battle for our Birds is going to be aerial 1080, a poison that is mixed into baits and used to control a range of pests, especially possums, rats and stoats. 1080 is biodegradable, dilutes quickly in water and does not build up in the food chain. It is very effective in controlling these introduced pests and well suited to New Zealand conditions. It can be safely applied by air and it is the most cost-effective method of providing landscape-scale pest control over difficult terrain.

## Effect of a 1080 operation on rats and stoats and mohua breeding

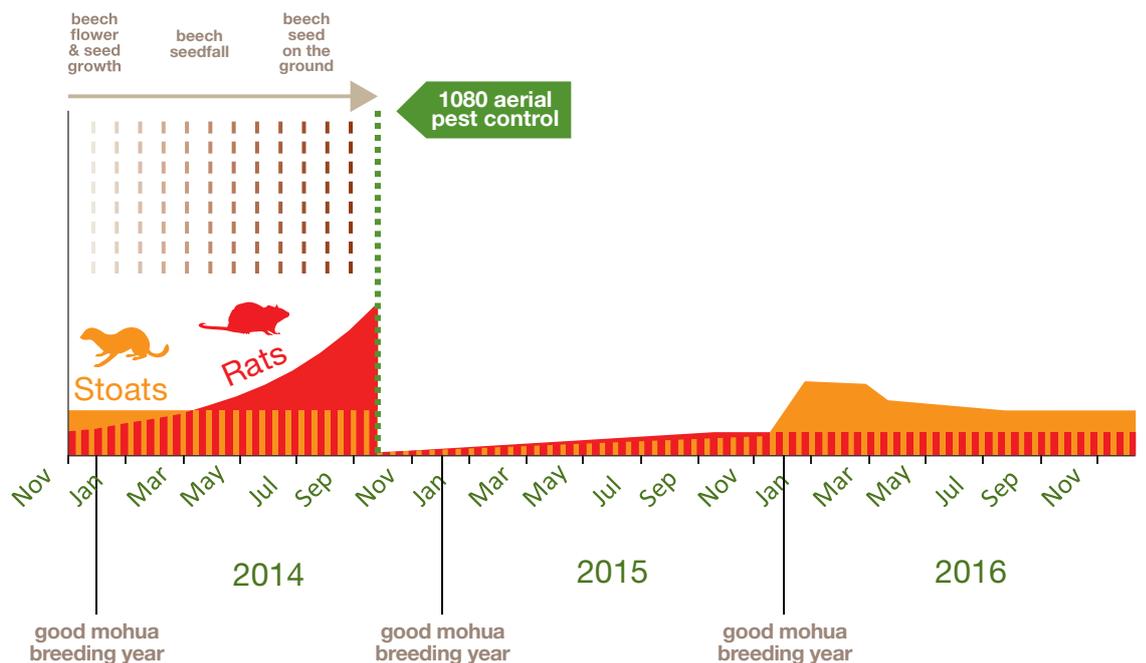
### Without pest control:

Rodent numbers build up during winter and expand rapidly with the abundant food source. Stoats, feeding on mice and rats, peak each summer. Native birds take a hammering.



### With intervention:

By monitoring rat numbers after prolific beech seeding, we can predict where the rodent and stoat populations will impact on native birds. Timely pest control allows birds to nest and fledge successfully.



The graphs above are models based on real figures from research in the Catlins, Dart Valley and other areas.

## WHAT'S NEW ABOUT THIS APPROACH?

The drastic impact of rat plagues was brought home to us in 2000. Mohua populations around the South Island took a huge hit. It was particularly alarming where the monitored population of mohua on Mt Stokes in the Marlborough Sounds was wiped out. We needed to find a way to manage rat population irruptions.

Before 2005 we had not used 1080 to control rats and stoats during plagues caused by beech mast. That's because DOC scientists had only recently found out that aerially applied 1080 killed stoats – stoats don't eat the 1080 pellets, but they do eat the dead rodents that have eaten the pellets, which then kills the stoats.



Rat eating Powelliphanta snail.  
Photo: Nga Manu Images

It's only in the last 15 or so years that we learned we needed to control rats and stoats in beech masts, and it's only in the last few years that we've been confident of the tools to use.



Photo: Herb Christophers

### Outsmarting a rat

*Rats are cunning – when they come across a new food they only eat a little bit, they then wait a while and come back and have some more. 1080 is a fast-acting poison so after they've eaten a little bit, they feel a bit sick and won't eat the pellets again.*

*If you pre-feed with non-toxic baits they have a nibble – find it's OK and then start hoeing into the baits. When a week or two later they come across toxic baits they eat them without hesitation, take in a lethal dose and die.*

## CASE STUDY: DART VALLEY, OTAGO

**2003:** No measurable rats in the valley.

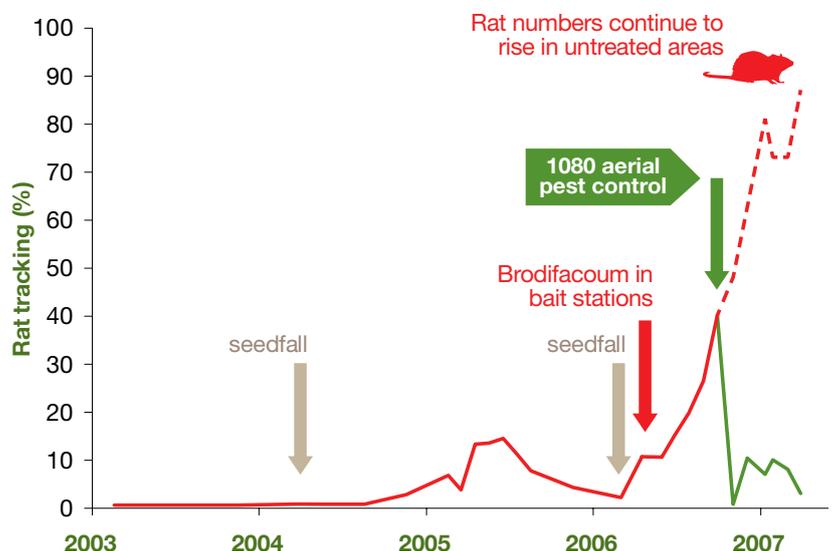
**2004:** After a small seed fall early in 2004, rat numbers slowly rose and declined again.

**2006:** After another seed fall, rat numbers were starting to climb rapidly. Poison in bait stations did little to reduce the numbers, so we applied aerial pre-feed, then in October used aerial 1080, which knocked down the rat population to very low levels.

**Success for mohua:** Numbers of mohua in the areas that received the poison control were unaffected by the rat plague.

**Proof of concept:** In a neighbouring block that we didn't poison, the rat numbers continued to climb and the mohua population was decimated.

### The effect of 1080 on rats



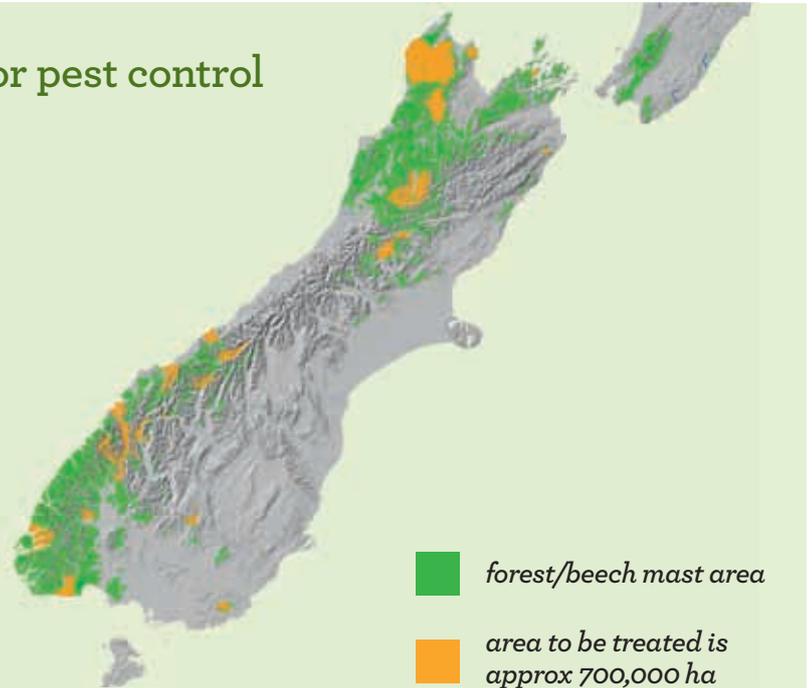
## WHERE AND WHEN

### Map of areas DOC is treating for pest control

The sites chosen for 1080 drops this year were chosen for:

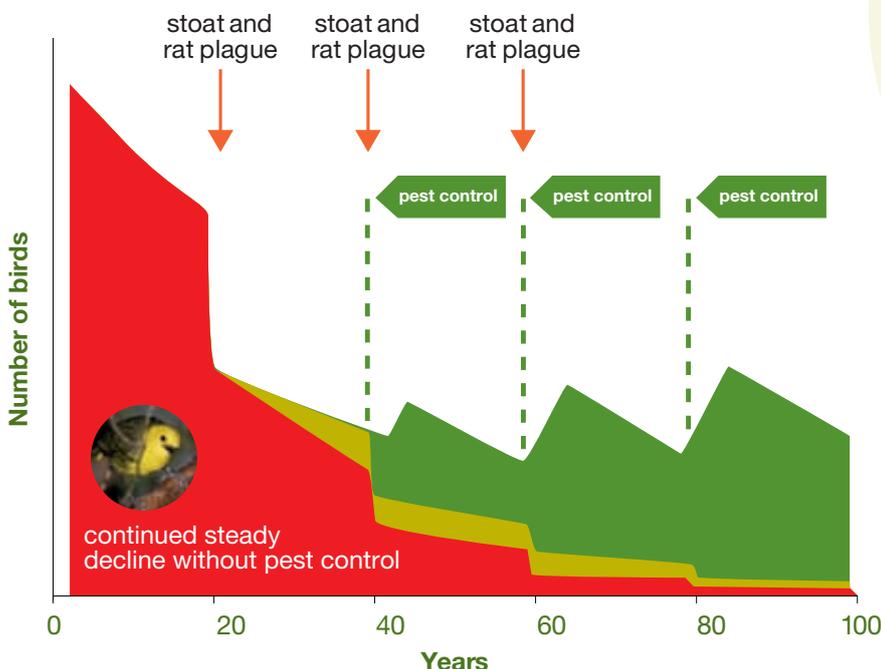
- *having species populations that might go locally extinct*
- *being high priority ecosystems – this includes not just specific endangered birds, but critical endemic plants and snails*
- *being representative sites*

*But we're treating less than 1/3 of the forest affected.*



## LONG-TERM IMPACT of Battle for Our Birds

- Without intervention, it looks like this: a steady saw tooth decline.
- Effect of a one-off intervention: short term gain – long term losses.
- If we did pest control on large beech mast years: maintenance and slow recovery.



### Recovery: *the ultimate goal*

If we take more intensive measures and more frequent control, we will see good population recovery, particularly for larger bird species that don't breed so fast, such as the blue duck/whio.



Photo: Herb Christophers



Kākā. Photo: Herb Christophers

## SUMMARY

**The massive beech mast event that caused the current pest irruptions requires quick decisive action to save populations of threatened species from further depletion. We can stop the rot but we want to look further ahead to species recovery. The most logical way is to increase the amount and frequency of pest control.**

In the long run we have to change the way we do business and seek ways to eliminate threats to native species. We are beginning to understand what drives beech mast events and we can now anticipate with more certainty where and when beech mast events might occur. Controlling pests that thrive during those beech mast years can be better planned.

As control methods are refined and new ones developed the effectiveness of pest control will increase, and with help from our conservation partners the Department of Conservation can control pests in even larger areas. The Battle for Our Birds will not just sustain populations of our native birds but it will lead to increases in their abundance and improvements in their habitat.

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### References:

King, C.M.; Moller, H. 1997: Distribution and response of rats *Rattus rattus*, *R. exulans* to seedfall in New Zealand beech forests. *Pacific Conservation Biology* 3: 143-155.

Elliott, G.; Suggate, R. 2007: Operation Ark three year progress report. Southern Regional Office, Department of Conservation, Christchurch.



# FOR MORE INFORMATION

Visit [www.doc.govt.nz/battleforourbirds](http://www.doc.govt.nz/battleforourbirds)

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Rifleman. Photo: Andrew Walmsley

New Zealand Government



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*Te Papa Atawhai*