

## Kahurangi Whio Survey Update



*Photo: Whio pair in the Leslie River, gravid female in foreground.*

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## Summary

The field work component of the whio survey of Kahurangi National Park (KNP) is all but finished, and data analysis/writeup should begin in late 2024. Approximately 783 kilometres of river have been surveyed across the national park over three years. The KNP whio population was booming when the survey began in July 2020. By May 2021, interim results were showing that there were >6 times more whio pairs than were found in the same rivers surveyed during the original KNP survey of 1998-2000. A possible population decline was detected in one river when it was surveyed in 2022. This prompted follow up surveys on that and a subset of other rivers which had already been surveyed. These confirmed that a widespread population crash had occurred, and in some rivers, it was significant with more than 70% of pairs having disappeared between 2022 and 2024. The decline is thought to be related to a prey size switch by stoats and possibly cats after a rat population crash occurring in mid to late 2020. This report provides an update on progress of the survey with a focus on the whio population crash.

## 1. Introduction

The interim report on the Kahurangi whio survey (Malham 2023, DOC 7330542) covered results only up to April 2023 as there were still a few rivers left to survey. The key points from this report were:

- The whio population in KNP had increased significantly: an overall increase of >5 times more pairs being counted in this survey than in the original 1998-2000 survey.
- Valleys that are trapped (primarily for stoats) and receive mast triggered aerial 1080 had a higher density of pairs overall than those that just receive aerial 1080. But there was variability and some 1080 only rivers were better than some rivers that have traps + 1080, probably reflecting variability in quality of habitat.
- A possible decline in the number of pairs was detected in some rivers that were surveyed more than once. This prompted further repeated surveys on some rivers (see below)

The survey has taken a long time to complete for a few reasons – the national park is huge with >1000km of waterway suitable for whio; the project has been under resourced which has made it more difficult to get help for completing surveys and using helicopters to access remote valleys (ideally there would have been enough \$\$ to employ a couple of contractors and we could have systematically worked our way through the park over a shorter time frame); the most optimal time of year for surveying is mid – late winter, when whio are at their most conspicuous, but this period is often very wet and unsettled with elevated river levels, so there have been long periods when surveying was not possible.

Information on the survey area, survey timing and methodology are covered in detail in the 2023 interim report.

### *1.1 A note on the 2011-2019 nest study (relevant to the Kahurangi survey results)*

A nest, duckling and adult survival study began in the Wangapeka catchment (Wangapeka-Fyfe Security Site) in 2011 with the aim of testing the effectiveness of integrated pest control (riverside stoat traps + mast triggered 1080) for whio. I took over running this study in 2016, and in 2017 we added a second, 1080-only site (Waingaro River) to the research. In the study reaches of each river we colour banded every known pair and carried out intensive observations, developing an intimate knowledge of all the bird's resident in each site. Over the four years of study, we saw both populations increase noticeably. For example, by 2019 in the un-trapped Waingaro river, there were 1.54 pairs/km of river (585m river per pair), an exceptional density of birds. Transitioning to the Kahurangi whio survey in July 2020 was timely as we suspected that the population had boomed.

The Wangapeka River component of the nest study (42 nests between 2011 – 2018) was published (Steffens et al 2022).

Some of the key findings of the paper are relevant to some initial findings of this survey:

- Adult female mortality was *higher in winter* than during the breeding season
- Nesting success was greatest in the breeding season following a 1080 operation
- Whio population growth, nesting success, duckling and adult survival were all better in the interior of the treatment block than nearer the edges
- Positive population growth was only predicted near the interior of the study area, c. 13km from the edge.

### *1.2 Recent whio history in KNP.*

It is useful to summarise the recent whio history in the national park: When the original Kahurangi survey was conducted (1998 – 2000), there was no predator control or whio management occurring in the national park. Establishment of two whio security sites (Wangapeka-Fyfe & Oparara-Ugly) around 2003 included deployment of river valley stoat traps and intensive management techniques- whiONE and later, Breed for Release (B4R), where captive reared juvenile whio are released back into the wild. Two large community run trap networks- Friends of Flora (FOF) and Friends of Cobb (FOC) were also established in the early 2000's and FOF made several captive reared whio translocations into the Flora catchment. These factors combined with a 2011 TB Free aerial 1080 operation in the Wangapeka followed by the 2014, 2016 and 2019/20 BFOB 1080 operations across

the wider park undoubtedly had a significant positive influence on population growth. Figure 1 shows the recent timeline of the KNP whio population.

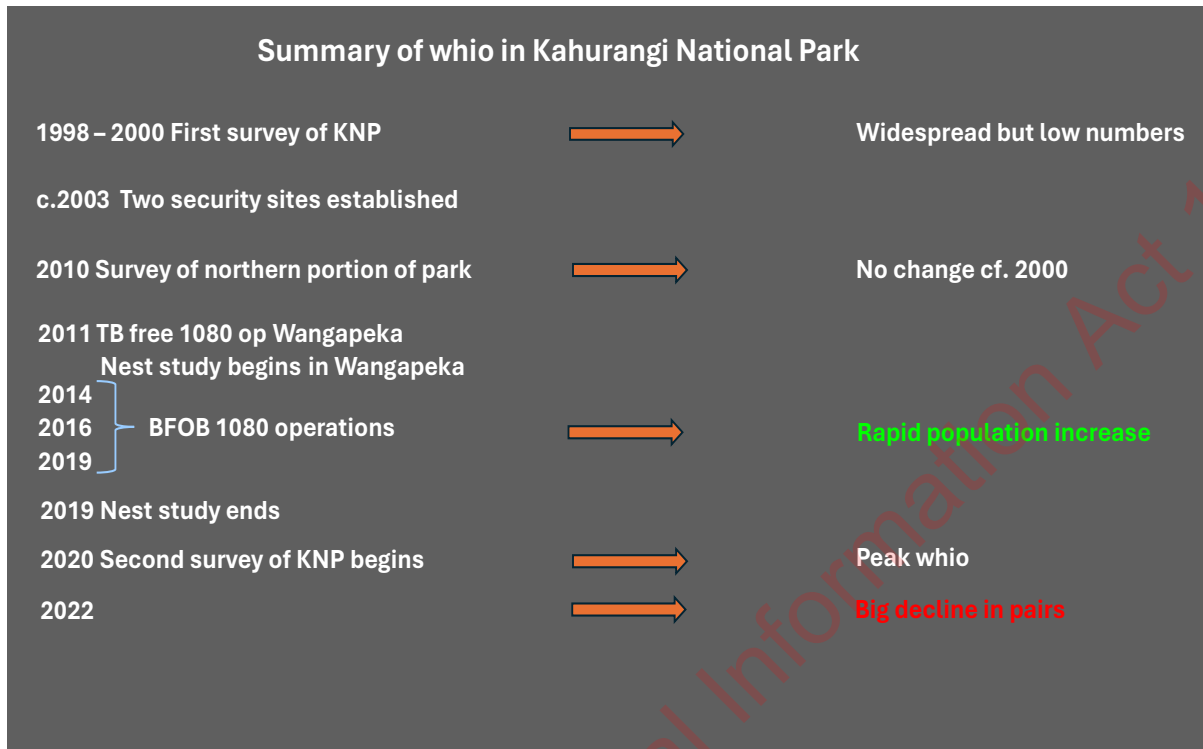


Figure 1: Brief history of whio in Kahurangi National Park

## 2. Kahurangi Survey Results

This Kahurangi survey began in July 2020, and results from the first few rivers surveyed indicated that the national park was at “peak whio”. A number of rivers including those in the Wangapeka-Fyfe security site were probably at carrying capacity with whio pairs. This population peak continued into winter 2021 and possibly beyond in some valleys. Results from across the national park were very impressive: as of May 2021, 311 pairs had been seen, a >500% increase on the original 1998-2000 total count of 58 pairs. It is probable that in early 2021 there would have been close to 500 pairs in the whole national park.

The last few rivers I had hoped to survey were completed in July 2023. There are a host of rivers we haven’t surveyed (Mokihinui catchment, western Karamea side creeks, Slate River, Matiri River), but lack of resources means they won’t be done as part of the Kahurangi wide survey.

Due to some big changes in pair numbers between 2021 and 2024 on many rivers, I am not going to provide a final pair estimate for the park in this report. This will be produced later 2024/25 with a modelling/GIS exercise planned. There are many variables to consider with producing the final

population estimate, such as history of predator control, quality of habitat, geology, documented decline etc.

## 2.1 Whio population crash

The Waingaro river (our former 1080-only study site) had its official survey in early 2022, and this revealed a 34% decline in the number of pairs (from 18 to 12), compared with what were in the valley in 2019 when the nesting study ended. Seeing this decline rang some alarm bells and prompted me to look at other rivers that had already been surveyed. To re-do all the rivers (hundreds of km) was out of the question so I selected a subset of the total that had been surveyed to date and set about running repeat surveys on them. All but one of the catchments I chose were accessible on foot to allow for multiple walk-through surveys at little cost- whio can be very secretive and inconspicuous, so rivers sometimes need to be walked multiple times to be sure that all possible birds have been accounted for.

The repeated surveys revealed that the decline was real, not just limited to the Waingaro river and significant in some rivers. Figure 2 provides a summary of the results. A few key points to note:

- Decline in most rivers occurred/began in winter 2021, but the Fyfe River population crashed in winter 2023.
- The biggest declines have been seen in the Wangapeka-Fyfe Security Site and predominantly nearer the edges, with no decline detected in the inner reaches of the site. This fits with findings of the nest study as described in the introduction and suggests that the riverside stoat traps may be able to “hold the line” in the interior of the site.
- The Leslie and Roaring Lion rivers (1080 only), both in the inner reaches of the park have seen similar levels of decline- 35-44% fewer pairs now than in their original 2021 and 2022 surveys.
- One river (South Branch Riuwaka River in Motueka “front country”) gained at least one pair in 2023. No whio or sign were detected there in July 2020, and they haven’t been observed in this site since the late 1980’s.
- No decline detected in the Beautiful River (tributary of the Roaring Lion) which is in the inner most reaches of KNP, but it possibly has a “naturally low” density of whio (I think due to geology).
- The rivers where major change has been detected mostly had a high density of birds when the “official” survey was conducted.



The average pair density on rivers that have been surveyed in each of 3 periods is shown in figure 3 to illustrate the overall decline. Pair density (pairs/km of river) is a standard and commonly used measure of whio abundance.

## *2.2 Western Kahurangi Rivers*

Rivers on the western side of the national park are surveyed most years by staff from the Buller district office who also maintain the Oparara-Ugly Whio Security Site. Their survey data has been added to the overall Kahurangi survey total. Pair decline has been noted in some of the rivers in their area during the same period we've seen it in eastern KNP: >60% decline in the Kakapo catchment and up to 30% decline in the Ugly River. The Kakapo catchment was not treated during the 2019 BFOB operations so it had a long period without 1080 leading into 2021 winter.



*Photo: winter survey campsite in the upper Crow River*

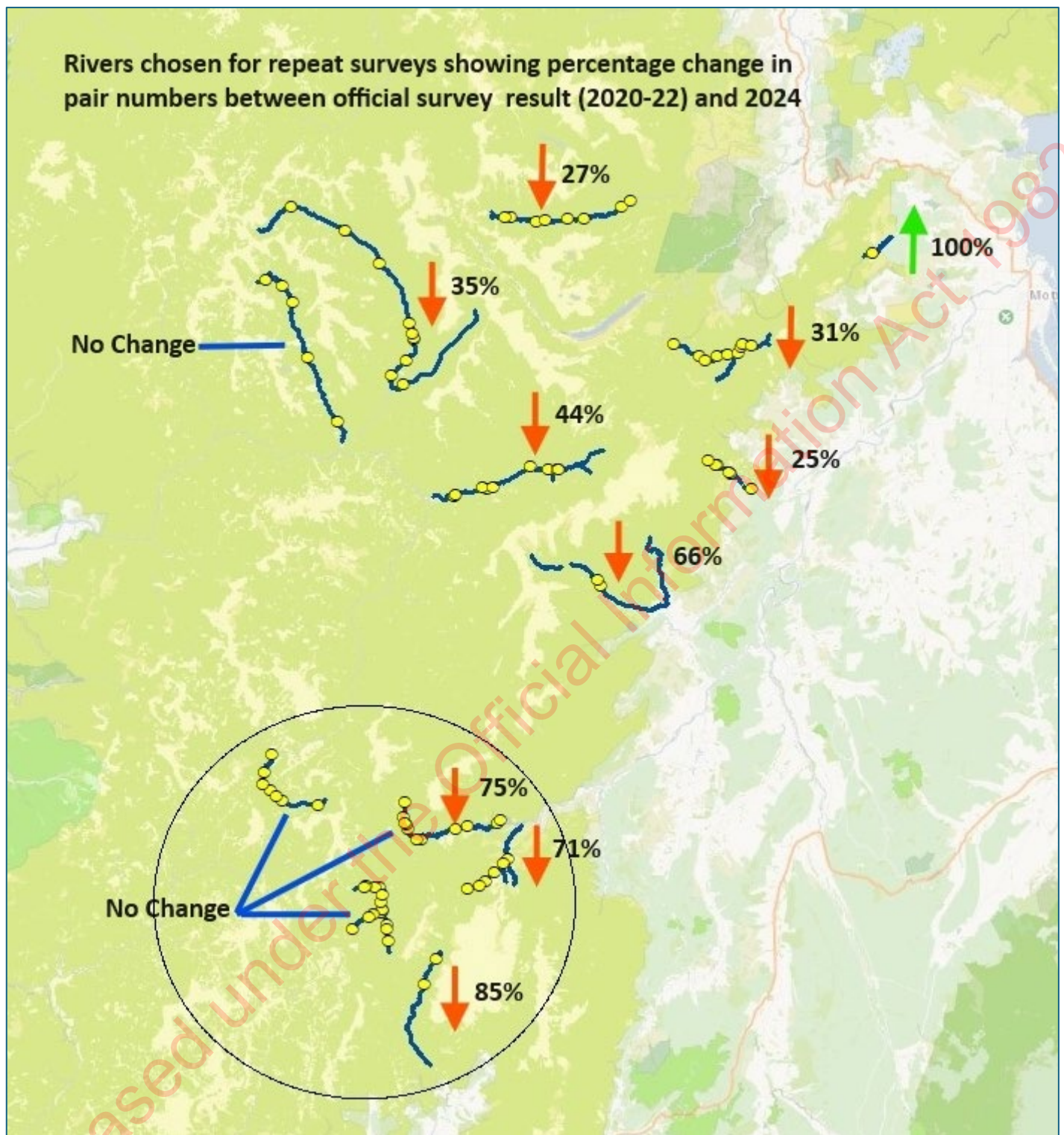
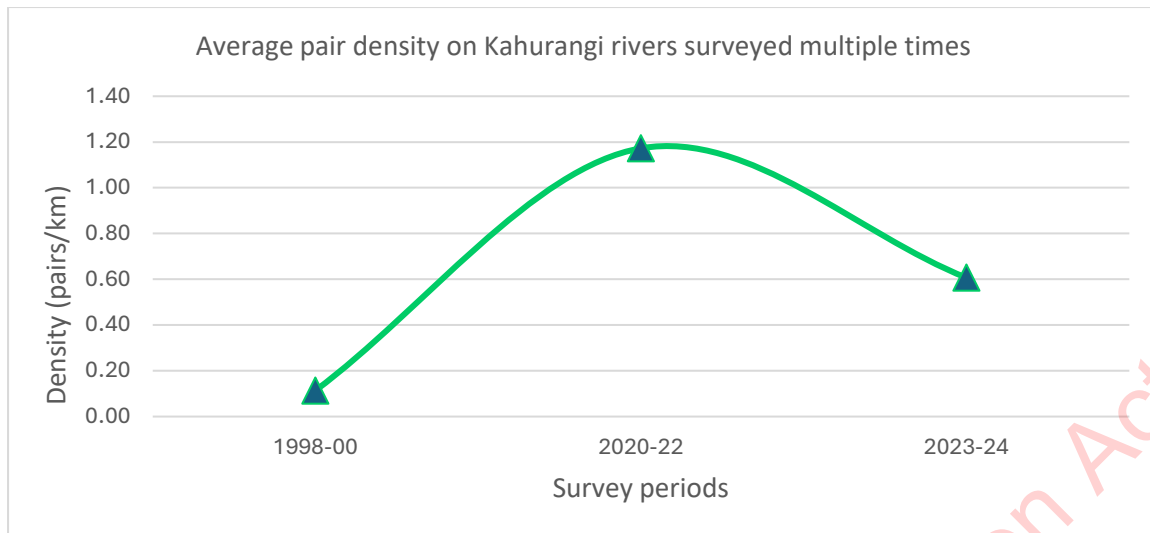


Figure 2: Rivers surveyed multiple times since their official survey (initial surveys conducted between 2020 -2022) and the percentage change in number of pairs that has occurred since then. Downwards facing red arrows indicate decline, upwards green arrow is increase. Yellow dots are pairs known to be resident in May 2024. The yellow shade is Kahurangi National Park, and the circled area is the Wangapeka-Fyfe whio security site.





*Figure 3: Average density of whio pairs counted in those rivers mapped in figure 2 which were surveyed in each of the three periods: 1998-2000, 2020-22 and 2023-24, showing the huge increase after 1998-2000 and the recent decline.*

### 2.3 South Westland Whio Survey

In May 2024 we surveyed the Paringa and Moeraki Rivers in South Westland. The two valleys are beech forested, adjacent, share a common mountain source and are reasonably comparable. The Moeraki is in the Abbey Rocks-Mataketake treatment block and has a history of more than 20 years of aerial 1080. The Paringa has no history of predator control. We theorised that if aerial 1080 alone was working really well for whio, that there should be significantly more pairs in the Moeraki than the Paringa, and it could lend more weight to Kahurangi findings.

Unfortunately, our survey results were not conclusive: 3 pairs were found in the Paringa, which was expected but only 2 in the Moeraki. Whio have a habit of being secretive and inconspicuous, spending much of the day hidden out of sight under boulders, banks etc. I have heard anecdotal reports of at least 3 pairs being seen in the Moeraki. The habitat in most of the Moeraki is very good for whio, so I expect that we missed seeing multiple pairs. I am hoping to be able to conduct a repeat survey of these valleys this financial year.

## 3. Discussion

### 3.1 Population growth

The spectacular increase in KNP whio numbers through the late 2010's and into 2021 is undoubtedly due to the combination of stoat trapping efforts, whiONE/B4R, and the multiple BFOB aerial 1080

operations. Many of the rivers in Kahurangi provide premium habitat for whio, therefore if predators are kept at low densities whio can flourish. The high densities of birds seen pre-decline in rivers such as the Waingaro, Wangapeka, Fyfe and Leslie are testament to this.

Annual whio productivity and recruitment is partially driven by climate- there is a correlation between frequency of winter floods and breeding: more frequent floods = fewer breeding attempts, presumably because females are less able to reach breeding condition when food is either scarcer or harder to reach. Our observations of breeding seasons during the nesting study showed that the really good years when most females attempt to nest are relatively rare and interspersed with seasons with very few nest attempts. One key finding of the nesting study was that nest survival was highest in the year of a 1080 operation: the best scenario for whio productivity is a good breeding season that coincides with an aerial 1080 operation. With regular (every 2-3 years) aerial 1080 operations there is obviously going to be an increased chance of an operation coinciding with a good breeding year.

### *3.2 Population crash*

The population crash discussed in this report has been widespread across much of the national park but appears most severe in the Wangapeka-Fyfe Security site. It indicates how vulnerable whio can be to predator prey switch events, and that regular, well timed aerial 1080 is crucial for their continued persistence.

### *3.3 The Fyfe River Crash*

Pair numbers in the Fyfe River dropped by **82% in winter 2023**. A dog survey in January 2023 found 11 pairs and then a walkthrough survey in December 2023 found *just 2 pairs*. A dog survey and second walkthrough survey were conducted in early 2024 to confirm that this decline was real and not just birds hiding off the river. The Fyfe is in the Wangapeka Fyfe security site and has a riverside trapline up the valley. It last had 1080 in February 2020.

Whio distribution up a river is very linear and it seems possible that a single predator (i.e. stoat) could have learnt to eat whio and worked it's way up the valley. A single ferret was blamed for killing 16 kiwi in Tongariro forest (Jess Scrimgeour *pers. comm*).

It is likely to take several years for the Fyfe to recover from this population crash.

### *3.4 Causes of decline*

The Kahurangi whio population crash was probably due to a combination of factors:

- Rat numbers were consistently high between ~2016 – 2020, with the 2019 “mega mast” adding to the issue, fuelling high stoat numbers, but probably also providing abundant preferred food for stoats = less likelihood of large prey being taken.
- Some of the 2019 Kahurangi BFOB operations were not very successful, with poor rodent kills (e.g. Cobb) which allowed rodents to quickly bounce back.
- Long delay between the 2019/20 operations in *adjacent* treatment blocks meaning higher likelihood of reinvasion of predators into treated blocks (i.e. within the national park as well as outside).
- Rats crashed in mid-late 2020 when carnivore numbers were still high; therefore, going into winter 2021 when carnivore prey abundance would have been dropping (in summer there will be a flush of baby birds, invertebrates etc), stoats (and possibly cats) would likely have become desperately hungry, forcing a switch in size of prey they were taking. Keeping in mind that who will be at the *upper* end of the prey size range for stoats.
- Long period without 1080 treatment since the 2019/20 BFOB operations. The Wangapeka block is currently 4 years, with next operation due February 2025.
- Trap shy predators- due to the long period between 1080 in the Wangapeka Fyfe there is a high likelihood of trap shy stoats being in the environment. For example, in the continuously trapped Whangarei Kiwi Sanctuary, kiwi chick survival declined over time (Roberston et al 2016). After a single pulse of 1080, chick survival increased by a significant amount (see *Figure 4*) and the study authors concluded that untrappable stoats accumulate in areas subjected to continuous trapping.
- Cats are an unknown part of the puzzle in KNP. However, we do know that they are widespread at least on the eastern half of the national park (see Figure 5). Cat sign has been seen on several of our surveys in remote sites. In recent years kittens have been caught by Friends of Flora (FOF) in the Flora Stream area and by the Wangapeka trapping group in the lower reaches of the Wangapeka-Fyfe security site.
- Ferrets are also an unknown. However, during 2023/24 FOF caught 3 juvenile ferrets; also, several juvenile(?) ferrets caught in the lower reaches of the Wangapeka Security site over the past few years.

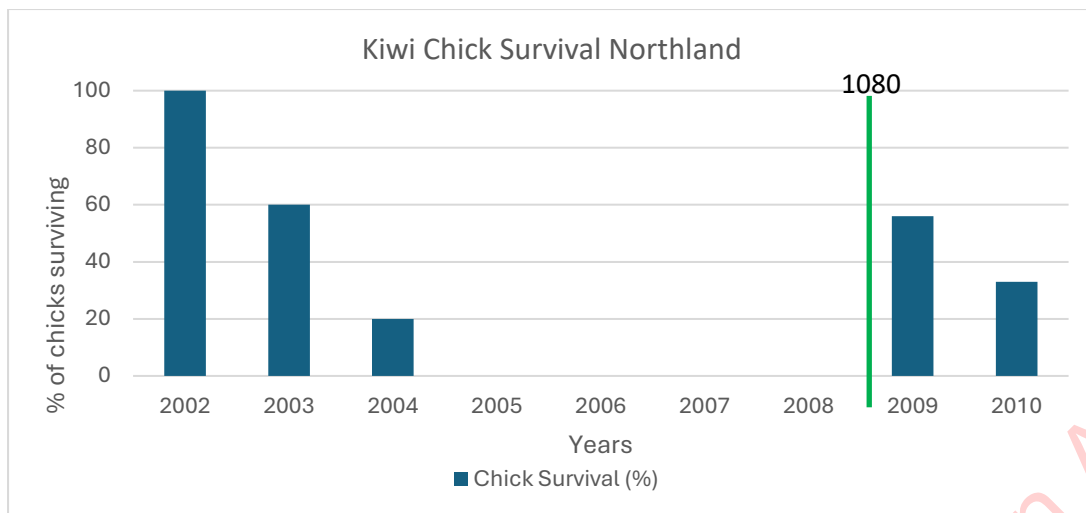


Figure 4: Kiwi chick survival in a continuously trapped site with improved survival after a single pulse of 1080. (Data from Robertson *et al* 2016)

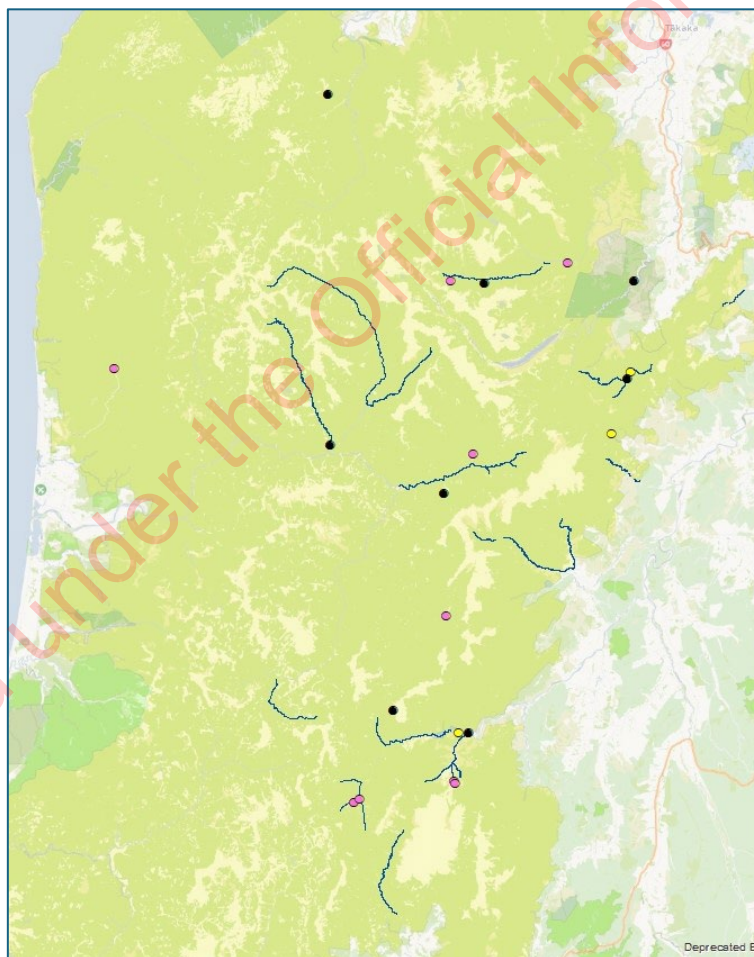


Figure 5: Cat and ferret sightings or captures in KNP (yellow shade). Blue lines are repeat survey rivers, black dots = cat sighting/capture; pink dots = cat poo/print; yellow dots = ferret captures. In 2023 a cat was seen near Roaring Lion hut in the middle of the national park.



### 3.5 The future

There has been a general decline in whio reported over the whole South Island, not just Kahurangi National Park. New protocols in the NPCP 1080 regime regarding timing of aerial 1080 operations will hopefully eliminate the prey switching issues that are likely behind much of the KNP decline. Recovery to early 2021 numbers of whio will probably take several years with some prolific breeding seasons and successful 1080 operations required.

The new 1080 regimes need to be tested for benefits to whio and a research proposal to continue long term monitoring on selected Kahurangi rivers across treatment blocks that have differing 1080 regimes is currently in preparation.

### 3.6 Kahurangi Survey writeup

The aim is to produce an internal report, presenting the raw results of the survey, river by river. There is also the intention to produce a journal paper, this will entail a GIS/modelling exercise which will be complex and will take some time to produce. The internal report, although large should be a relatively straightforward piece of work.

## References

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- Robertson, H., Craig, E., Gardiner, C., & Graham, P. (2016). Short pulse of 1080 improves the survival of brown kiwi chicks in an area subjected to long-term stoat trapping. *New Zealand Journal of Zoology*, 43(4), 351–362.
- Steffens, K. E., Malham, J. P., Davies, R. S., & Elliott, G. P. (2022). Testing the effectiveness of integrated pest control at protecting whio (*Hymenolaimus malacorhynchos*) from stoat (*Mustela erminea*) predation in beech forest (Nothofagaceae). *New Zealand Journal of Ecology*, 46(1), 1–13.