

# Arawai Kākāriki

## 2021–2022 Programme Update



The northern border of the thousand hectare fire at Awarua. Photo: DOC

Welcome to our annual update on the Arawai Kākāriki wetland restoration programme, which provides a summary of our conservation efforts for 2021/2022. Thanks to all our partners supporting wetland conservation across New Zealand.

### Highlights from the past year. See inside for details:



Thermal imaging giving us new insights into bittern



Improving water management at Whangamarino wetland



Working collaboratively to restore the Ōtuwharekai lakes



The Arawai Kākāriki team at INTECOL 2021



An update on the health of Waituna Lagoon



Positive results for biodiversity after drain blocking at Moawhitu wetland



Responding to recent peatland fires



Expanding protection for vulnerable braided river birds

## Where are bittern/matuku nests? Thermal drones can help

A successful trial using thermal drone imagery will make it much easier for DOC researchers to locate and track critically endangered bittern/matuku females and chicks. Previous research on these highly cryptic birds is biased towards males, who are much easier to locate due to their distinctive booming call. Finding nests usually requires hours of patient watching to spot females exhibiting nesting behaviour, then wading through the dense raupō to locate the nest.

The drone trials – carried out at five wetlands around Bay of Plenty and Coromandel due to lockdowns in Waikato – involved first listening for booming males to identify bittern territory. Ecologists from Flightworks then flew the thermal imaging drones across 10–15-hectare sections of the wetlands, spotting at least 11 bitterns and two nests. The drones were inconspicuous enough to capture the birds' natural behaviour, giving us rare footage of bitterns mating.

Researchers on foot set up cameras hoping to understand more about bittern hatching and fledgeling success. The cameras relayed some bad news – the chicks from both nests were preyed upon by harriers a few days after they hatched. Harriers nest in similar habitat to bittern and usually prey on small predators like stoats, but when trapping removes this food resource harriers turn to easy prey like bittern chicks. With a greater understanding of bittern nesting requirements and threats, we are better equipped to plan management to increase bittern breeding success.

## Our new challenge: responding to fire

Two of our Arawai Kākāriki wetlands were devastated by massive fires in 2021 and early 2022 – check out p5 and p7 to read about what we're doing to prepare for future fires.



Department of  
Conservation  
Te Papa Atawhai

## Awarua-Waituna

### Raising awareness of Waituna Lagoon health

A new [report card](#) provides an update on the state of Waituna Lagoon. Our monitoring, which focuses on aquatic plant *Ruppia* as an indicator of lagoon health, revealed concerning results – none of the six ecological targets for the lagoon were achieved in 2021. Several years of data have indicated that artificial openings of Waituna Lagoon – carried out to lower water levels in surrounding land – negatively affect *Ruppia* growth and reproduction, highlighting the need for an opening regime which supports the health of the lagoon. We’re working as part of [Whakamana Te Waituna](#), a multi-agency initiative, to improve management of opening events and sharing our monitoring results to raise awareness of the precarious state of this precious ecosystem.

### What food are the fish eating?

As part of improving the management of Waituna Lagoon, the team is also ensuring adequate fish passage remains to support healthy populations of īnanga, giant kōkopu and tuna/eel. There is a balance between reducing the frequency of lagoon opening to enable a more natural regime and supporting the coastal recruitment of fish species like īnanga – potentially important food sources for giant kōkopu and tuna (longfin eel). We needed to know more about the aquatic food web. Led by the Cawthron Institute, a stable isotope study has identified the lagoon-derived and river-derived food in fish diets at Waituna. They found that giant kōkopu tend to rely on invertebrates from the river rather than lagoon prey like smelt and īnanga, while large eels feed almost entirely on lagoon fish. This means we need to make sure the lagoon management is designed to replenish fish stocks – great information to guide the restoration programme!



Tuna/eel at Waituna. Photo: DOC images



Counting dotterels along the coast. Photo: Max Viereck

### Identifying threats to dotterel breeding success

Over the past 12 months we assessed how effectively our introduced predator trapping programme is protecting dotterel nests. Fifty-six nests were located on an 80ha area known to be the dotterels’ primary breeding site, and cameras were set up to record activity. Twenty-one (38%) of the nests hatched successfully, while two were preyed upon by hedgehogs and one likely by a black-backed gull. However, 18 of the nests (32%) were confirmed to be preyed on by harriers, and there’s a high likelihood that harriers were to blame for the loss of the remaining nests whose fate was unknown. So while the trapping network appears to be working well to control mammalian predators, harriers are a threat. In some good news, there are more breeding female dotterels and a greater overall abundance of birds than we assumed from annual bird counts. The camouflaged nests and eggs are hard to spot in the pea gravel and birds fly back and forth during the bird count, so the extra time and expertise of the searchers meant we could get a more accurate picture of the dotterel population.

# Whangamarino

## Team effort to restore native biodiversity

The Whangamarino team, in a new relationship with Waikeria prison, led a group effort to establish 5000 new plants to restore the riparian habitat between the wetland and ex-grazing land at Whangamarino. We're grateful for the outstanding contribution from the prison's nursery, who supplied us with harakeke, te kouka, karamu, *Carex* and other sedges. A couple of planting days were organised, helped by the team from the DOC Rostrevor Street office, 30 people from an Auckland insurance company, and Waikato University. The plants will benefit the wetland through sediment and nutrient filtration and native habitat enhancement. An additional 4,500 harakeke and *Carex* species were planted as a trial to prevent the parasitic weed *Cuscuta campestris* from spreading further and reduce the need for weed control in the future.

## Improving water level management at Whangamarino Wetland

Wetlands need water, but not too much water or too little. Restoration of Whangamarino requires understanding the water requirements of the wetland, to help DOC and our partner stakeholders establish a sustainable water regime. Native wetland plants and fish are reliant on certain water levels throughout the wetland, and bittern need a specific water depth to hunt. We are monitoring water levels across the wetland as part of a review of the Whangamarino weir and working in partnership with iwi to understand how water levels affect the cultural health of Whangamarino. The weir maintains a minimum water level which is essential for looking after the wetland, especially in summer. This minimum water level holds the line for biodiversity, but we're looking at how we can optimise water levels to give native wetland species the best chance of flourishing. Water levels can affect drainage in surrounding farmland, so the team is working with the council, iwi, Fish & Game and landowners to balance wetland values with other land uses.



Team effort at Whangamarino. Photo: Lizzie Sharp



Whangamarino wetland. Photo: Mary Beech

# Ōtuwharekai

## Doubling our trapping to protect vulnerable braided river birds

We're intensifying our trapping efforts in the upper Rangitata to bulk up protection for braided river birds. Data from the six previous years of trapping indicates wrybill and black-fronted terns are benefiting compared to the untrapped lower Rangitata, but there is still more work to be done to improve nesting success. Funding from LINZ has allowed us to almost double the number of traps, as well as restarting black-backed gull control. The increased funding also allows us to protect tern colonies with what the Operations team has dubbed the ring of steel – hundreds of traps surrounding each colony.

Introduced predators aren't the only threat to the birds – river flooding also poses a significant risk. This last year 15% of monitored nests were lost to floods, and in 2020/2021 around three-quarters of the nests were flooded out. Climate change may make floods more frequent, making it even more important our predator control safeguards the remaining nests.



Upper Rangitata tracking map. Image:DOC



Trapping in upper rangitata. Photo: Wako Tanaka

## A new cross-sector and stakeholder partnership for lake health

Led by the Operations Manager, DOC is helping to guide and support a multi-stakeholder working group trying to address declining water quality in the Ōtuwharekai lakes. The group was initiated by three rūnanga in 2019 – Te Rūnanga o Arowhenua, Te Ngāi Tūāhuriri Rūnanga and Te Taumutu Rūnanga – to address ongoing concerns about deteriorating water quality and its effects on the ecological and cultural values of these high-country lakes. Alongside iwi, rūnanga, statutory bodies (ECan, LINZ, Ashburton District Council and MfE), Fish & Game, and local farmers, we're continuing to advocate for restoring and improving lake health, with a focus on reducing catchment nutrient loads.

## Checking on kākahi in the Ōtuwharekai lakes

Kākahi (freshwater mussels) play an important role in lake ecosystems, but various pressures, especially deteriorating water quality, mean kākahi are declining in many rivers and lakes in New Zealand. As part of the working group collaboration, we commissioned a survey to see how kākahi populations are faring in eight of the Ōtuwharekai lakes. The survey, led by NIWA and our freshwater technical team, compared kākahi populations against baseline results from 2012. Results were mixed: kākahi remain present in all eight lakes, and their overall distribution, density, and population size structure are similar to 2012 for most of the lakes. However, there is a concerning decrease in the density of kākahi aggregations in Lake Emily (c. 60% decline) and Māori Lake West (17% decline). There was also a concerning absence of smaller kākahi in the lakes, which likely indicates that recruitment has been impacted for a number of years.



NIWA dive crew surveying for kakahi on Māori Lake West. Photo: Tom Drinan



Moawhitu wetland on D'Urville Island. Photo: Tom Drinan

## Support sites

### Invertebrates benefit from rewetting Moawhitu

Restoring water levels at Moawhitu wetland has benefited native wetland plants and aquatic invertebrate communities. The wetland was drained in the early to mid-1900s for agriculture, with a vast 12km network of drains dramatically lowering the water level by over a metre. As part of a multi-partner initiative led by Ngāti Koata, the Operations and Arawai Kākāriki freshwater team carried out hydrological work to restore the mauri and wairua of this precious wetland. A suite of ecological and hydrological monitoring was carried out before a temporary water level control structure was installed in 2019. Following its installation, water levels in the wetland increased by over 50 cm, with monitoring showing extremely positive results for the native wetland plants and aquatic invertebrate communities.

### Science supporting mātauranga Māori at Lake Moawhitu

The partnership with Ngāti Koata is going from strength to strength, with new Jobs for Nature freshwater funding from MfE. Restoration work across the wider wetland has seen improved water levels and positive results for biodiversity, but the lake ecosystem is still threatened by severe water quality issues and loss of habitat for taonga species. Excessive phosphorus levels from catchment run-off and lakebed sediment cause ongoing algal blooms, aquatic plants are scarce, and habitat for native fish species is limited. The new project aims to restore the ecological and cultural mauri of Lake Moawhitu – once an important mahinga kai site. Over the next five years the team plans to reduce nutrient supply through lake restoration, reintroduce woody habitat for taonga fish species, and undertake extensive revegetation.

### Urgent restoration needed after Kaimaumau fire

The devastating peat fires that recently tore through Kaimaumau-Motutangi wetland in Northland have damaged over 70% of the wetland. Urgent action is needed to give the wetland and the native species living there the best chance of recovery and stave off long-term ecological degradation. An Ecological Advisory Group, supported by Arawai Kākāriki, has identified critical action areas to reduce risk of future fires, halt the decline of threatened species and hold back weed invasion, and limit carbon emissions. Raising water levels in the drained areas of the wetland is one of the most urgent needs. A lower water table leaves the peat drier and more susceptible to fire, as well as making it easier for invasive weed species – which are more flammable – to take hold. The recovery plan is still in its preliminary stages, and will require support and long-term commitment from all partners to reduce the risk of future fires and protect the wetland, its biodiversity, and the surrounding community.



Burnt trees at Kaimaumau. Photo: Abraham Witana

## Research and partnerships

### Arawai Kākāriki at INTECOL 2021

Arawai Kākāriki was a sponsor of the INTECOL international wetlands conference – unfortunately held online due to COVID 19 – with several members of the AK team presenting and chairing symposia. Hugh Robertson’s two presentations covered sustainable agricultural practices, and critical barriers to achieving wetland restoration in New Zealand, while Colin O’Donnell discussed the threats, management challenges and the development of tools in restoring wetlands. Tom Drinan presented on the dramatic improvements in invertebrate communities after rewetting at Moawhitu, Russ Parai/Dan Moore discussed the role of mātauranga Māori in restoration, and Emma Williams shared her research on how artificial flood schemes in wetlands affect bittern.



### eDNA research partnership with local hapū and Cawthron Institute

DOC staff were lucky to have the Cawthron Lakes380 team involved in the Ōtūwharekai lake kākahi surveys, to test the application of a new environmental DNA (eDNA) tool to detect kākahi. Cawthron took the opportunity to do this research while the traditional kākahi monitoring was being undertaken by NIWA with support from Te Rūnanga o Arowhenua and DOC. Traditional monitoring, where divers spot kākahi, relies on good underwater visibility and is costly and time-consuming, limiting how many lakes can be regularly monitored. However, the new molecular approach, which is based on detecting kākahi in environmental samples like water or sediment, is a much quicker and more cost-effective way to detect populations. As part of their research, Cawthron were seeing just how many samples are needed to accurately detect kākahi in lakes.



Sue Clearwater surveying for kākahi on Gentleman Smith Stream (Feb 2021). Photo: Tom Drinan

## Recent publications:

- [Burton et al. 2022. Repeat survey of kākahi \(freshwater mussels\) in the Ō Tū Wharekai Lakes.](#)
- [Ruppia report card 2021 – An update on our 2015 report card about the health of Waituna Lagoon.](#)
- [Williams. 2021. Potential factors affecting the calling rates and detectability of crane and rail species: a review. DOC Research and Development Series 365.](#)
- [Verburg and Woodward. 2022. Sediment capping agents for use at Lake Moawhitu.](#)
- [Stewart et al. 2021. Assessing the contribution of lagoon-derived diet to giant kōkopu, eel and trout in Waituna catchment, Southland.](#)
- [Convention on Wetlands. 2021. Global Wetland Outlook: Special Edition 2021. Secretariat of the Convention on Wetlands, Switzerland.](#)





After the fire at Kaimaumu. Photo: Abraham Witana

## Profiling wetlands

### Rohe Kōreporepo documentary

Arawai Kākāriki supported the production of the wetland documentary Rohe Kōreporepo – the Swamp, the Sacred Place which was launched at the INTECOL conference and subsequently shown at film festivals around New Zealand. The documentary highlights the work kaitiaki are doing to restore Aotearoa's wetlands driven by Mātauranga Māori.

### New book - Life in the Shallows: The wetlands of Aotearoa New Zealand

Arawai Kākāriki supported the publication of a new book to promote wetland conservation, and the work and experiences of leading researchers. Led by the National Wetland Trust, the book features wetlands around the country and profiles some of Arawai Kākāriki's outstanding science efforts. Check it out [here](#).

## On the horizon

### Bird predators just as big a challenge

Trapping efforts have successfully reduced introduced predators at Arawai Kākāriki wetlands, but there is a catch. The small mammals are food for harriers. Without them, harriers return to their native prey options, which include eggs and chicks of vulnerable wetland birds. These species would once have co-existed, but the changing mosaic of landscapes has left species like matuku/bittern with only fragments of habitat and made any predation a much greater risk. Addressing bird predation is a priority for future research.

### Responding to fire and climate change

During 2021 and 2022 massive peatland fires occurred at Awarua and Kaimaumu-Motutangi. The fires contributed to loss of biodiversity, as well as a huge loss of stored carbon. One of the key goals of Te Mana o Te Taiao (the Aotearoa New Zealand Biodiversity Strategy 2020) is to restore indigenous ecosystems, including wetlands, as part of climate change mitigation. Through Arawai Kākāriki we hope to identify options to rewet drained peatlands, and increase the resilience of peatlands to fire – for both biodiversity and climate benefits.

### Improving the coordination of wetland restoration across New Zealand

An overarching goal of Arawai Kākāriki is to increase the restoration of wetlands across all regions of New Zealand. There is increasing recognition that restoring wetlands helps to improve water quality and reduce carbon emissions, as well as protecting biodiversity. A roadmap for wetland restoration in New Zealand would help all sectors and stakeholders to better coordinate efforts to restore wetlands.

