

# Biodiversity Team

*Te Tira Rerenga Rauropi*

Annual Report 2022-2023



A male, native, yellow mayfly (*Ameletopsis perscitus*), found at Mt Tāika, Whangārei. The juveniles are the only carnivorous mayfly larvae in New Zealand.

# Foreword

## *Nau mai, haere mai*

This is the second annual report on the work completed by the Biodiversity team for the Northland Regional Council, covering the 2022-2023 financial year. Within this report you will see the work that the team has undertaken to support community and restoration actions for wetlands, lakes, forests, and our coastal environment. Biodiversity is the variety of living things and Te Taitokerau (Northland) is regarded as one of Aotearoa New Zealand's biodiversity hotspots.<sup>1</sup>

The Biodiversity team, within the Council's Environmental Services Group, works alongside mana whenua and communities to help protect our biodiversity and the life supporting systems that nurture it. Across council the Biodiversity team gives technical advice and support to other teams including Planning and Policy, Land Management, Science, Monitoring, Biosecurity, Community Engagement, Regulatory Services, and Community Resilience.

This was a productive year for our biodiversity projects despite a few challenges. A very wet summer was followed by Cyclone Gabrielle in February 2023, creating disruptions and more effort, not just for the team but for our local communities. Despite this, a full programme of work was delivered, and we were able to provide quality advice, support and hands on work in the community.

On the coast we joined community groups, hapū, and schools to put over 16,000 native plants in the ground to restore coastal dunes at 17 sites. We've monitored dunes at 12 sites to track changes and support good management decisions, working alongside hapū kaitiaki and CoastCare groups. In the Bream Bay area, we continued a fauna monitoring trial with Patuharakeke Te Iwi.

We also participated in working groups for Ripirō and Bream Bay beaches to look at issues like environmental damage caused by vehicles and explore collaborative approaches to mitigation.

The five-year Freshwater Improvement Fund (FIF) Dune Lake project, jointly funded by the Ministry for the Environment (MfE), finished in March 2023. We delivered most project objectives which resulted in improvements for more than 25 lakes. An extension to the hornwort control and Māori partnerships workstreams was granted until June 2024 to complete this important work. We held hui with Māori partners to find out their priorities for ongoing lakes work and to explore and embed ways of working together to improve freshwater ecosystems by developing enduring and sustainable partnerships.

Since 2011 we have undertaken Wetland Condition Index (WCI) monitoring at more than 30 sites, many of which are in their fourth cycle of monitoring. Most of these wetlands are improving in ecological condition, largely thanks to the hard work of the landowners and the provision of funding support for stock exclusion via NRC's Environment Fund.

A new National Policy Statement for Indigenous Biodiversity came our way towards the end of the year, and this sits alongside the other policies around freshwater and the coast to give direction to councils around protecting, restoring, and maintaining biodiversity.

The goal of the Biodiversity team is to keep supporting our communities and mana whenua to maintain and enhance biodiversity for the future of all Northlanders.

## *Our Northland – together we thrive*

<sup>1</sup> Department of Conservation, 2014, p. 28. Northland Conservation Management Strategy 2014-2024.



**Ruben Wylie**

Pou Tiaki Taiao – GM Environmental Services



**Geoff Crawford**

Chair – Biosecurity and Biodiversity Working Party

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*Endemic orb web spider (Backobourkia brouni) found at the Otakairangi Wetland. Photo credit: Scott Bartlam.*



# 1 Tīmatanga kōrero

## Introduction





# Background

**Te Taitokerau (Northland) has a particularly rich diversity of plants and animals with many unique and distinctive ecosystems found nowhere else on earth.**

Our mild climate, coastal influence, diverse soils and landforms, and long geological periods of isolation from the rest of New Zealand have resulted in a richness of species and ecosystems. Northland is recognised as a biological treasure chest with a notably high proportion of rare species.

Northland's land area occupies around 1.25 million hectares, with approximately 33% of this being natural habitat. Around half of this natural area is public conservation land with many high value areas on private or Māori land. Most lowland forests and wetlands have been impacted by development.

The greatest marine biodiversity in New Zealand is found around the Northland coastline due to its exposure to two major ocean systems, as well as an array of islands and estuaries, and a complex, indented east coast. This includes a diversity of coastal habitats, estuaries, and dunes on the open coast. A large proportion of original duneland has been converted to forestry and pasture while remaining dunes are under threat from pests and weeds and other human impacts such as driving vehicles over dunes.

The role of Northland Regional Council in the maintenance of biodiversity can be described as supporting environmental and habitat management interventions which can occur in the marine, terrestrial, and freshwater space. These actions occur on many different land tenures and include habitat and species restoration or management of adverse effects.

Relevant statutes to biodiversity management include the Resource Management Act (RMA) 1991, Biosecurity Act 1993, Local Government Act 2002, Environmental Monitoring and Reporting Act 2015, Marine Reserves Act 1971, and Maritime Transport Act 1994. NRC policies or plans relating to the Biodiversity team's work include Regional Policy Statements and Plans including the Northland Regional Pest and Marine Pathway Plan (2017-2027).

In May 2023 the National Policy Statement for Biodiversity (NPS-IB) was approved and it came into effect in August. This Policy Statement gives direction to councils around protecting, restoring, and maintaining indigenous biodiversity across Aotearoa New Zealand. It sits alongside the National Policy Statement for Freshwater Management (2020) and the NZ Coastal Policy Statement (2010) and implementation of the NBPS-IB will be a key driver of council directions for biodiversity over the next few years. These policy statements give effect to Te Mana o te Taiao (New Zealand's Indigenous Biodiversity Strategy 2020) and recognise increased opportunities for developing partnerships with Māori.

A work plan is developed annually by the Biodiversity team which outlines performance targets. Key strategic documents and projects include the Northland Lakes Strategy and its update (2012 and 2014), Review of Northland Lakes Strategy 2020 and recommendations for the future (2021), Top Wetlands Project, and Northland Biodiversity Actions and Ambitions of the Northland Regional Council (draft) 2018-2028.

## Vision

"Northlanders value and care for the region's biodiversity and work together to ensure it is sustained now and into the future."

## Goals

**NRC must work with the community and other agencies to support proactive and long-term biodiversity effort via collaboration, combining resources, synchronising actions, raising awareness, motivating, incentivising, and encouraging positive, ethical actions.**

In the main, NRC's role in biodiversity management is about fostering enduring partnerships with iwi/hapū and the community to enable and encourage people to look after our biodiversity, sustain the environment and deliver essential and provisioning benefits to all Northlanders. Ultimately, the state of Northland's environment is determined by our people and visitors.

# Team Expertise

## **Lisa Forester**

*Biodiversity Manager*

Team lead, botany, threatened plants, weeds, lakes and wetland management, native forests.

## **Jacki Byrd**

*Freshwater Specialist (Team Deputy)*

Freshwater Improvement Fund (FIF) Dune Lakes Project Manager, lake management, aquatic pest weed control, land management.

## **Laura Shaft**

*Senior Biodiversity Advisor - Coastal*

Coastal workstream lead. CoastCare programme co-ordinator, dune restoration, dune monitoring, nature-based solutions for coastal hazards, community engagement, support for oiled wildlife response.

## **Katrina Hansen**

*Biodiversity Advisor*

Native birds and wildlife, wetland programme co-ordinator, freshwater ecology, wetland monitoring, oiled wildlife response lead Northland and MNZ National Response Team, data management and analyst, NRC programme auditor.

## **Brooke Gray**

*Biodiversity Advisor*

Native birds and wildlife, freshwater biodiversity, wetland monitoring, biodiversity education, data management.

## **Stephanie (Steph) Tong**

*Biodiversity Advisor*

Botany, native birds and wildlife, terrestrial ecology, terrestrial and wetland monitoring, community engagement, iwi/hapū partnerships.

## **Loren Carr**

*Biodiversity Advisor (fixed term)*

Bat monitoring, lakes management, coastal monitoring, general biodiversity, data management, biodiversity education.

## **Claire Heyns**

*Biodiversity Advisor (fixed term)*

Native fish, pest fish control, Check Clean Dry Advocate, assists with CoastCare and wetland monitoring.

## **Solomon Moore (Sol)**

*Biodiversity Contractor*

Assists with CoastCare, Check Clean Dry, biodiversity education, and general work.



*(Most of) the Biodiversity team.*



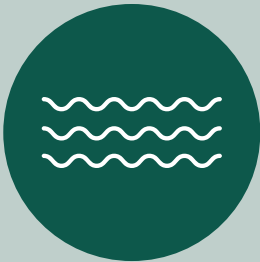
# Practical Biodiversity Management

Biodiversity delivery actions are undertaken by Council in the following areas:



## Freshwater

- Lake ecological monitoring
- Freshwater Improvement Fund Dune Lakes Project
- Coordination of wetland programme
- Wetland advice and restoration plans
- Wetland monitoring
- Freshwater partnerships and community capability building



## Coastal

- Dune restoration and protection advice and implementation
- Support network of CoastCare Groups
- Iwi/ hapū partnerships for dune protection and restoration
- Vehicles on beaches working groups and advocacy
- Dune health assessments and monitoring
- Coastal education and awareness events and communications
- Support Kaitiaki Takutai Ranger programmes



## Terrestrial

- Terrestrial monitoring and surveys
- Assist community led Bioblitz and biodiversity surveys
- Communications - terrestrial education and awareness
- Terrestrial iwi/hapū partnerships
- Supporting building community capability



# 2 Whakarāpopoto ā pūtea

## Financial Summary



*Kahikatea (Dacrycarpus dacrydioides) canopy, Pātapa North, one of the winning photos in the 2022 NRC staff photo competition. Photo credit: Claire Heyns.*



Overall, for the Biodiversity budget, there was a non-favourable variance of \$55,458 (7.3% expenditure) as at the end of June 2023. Over-expenditure was due largely to unforeseen increases in delivery costs and phasing issues from the previous year.

| Biodiversity Activities<br>2022- 2023 | Budget (revised) | Actual         | Variance     |
|---------------------------------------|------------------|----------------|--------------|
| <b>Expenditure</b>                    | \$1,024,581.95   | \$1,091,630.08 | -\$67,048.13 |
| <b>Revenue</b>                        | \$263,906.04     | \$275,495.25   | \$11,589.21  |
| <b>Operational deficit/surplus</b>    | -\$760,675.91    | -\$816,134.83  | -\$55,458.92 |

**Biodiversity Admin:** \$644,112. There was an overspend of just over 10%, attributed largely to spending in the contractor code which was covered by an underspend in the wetland's contractor budget. This covered half of a fixed term contract which sat between the Biosecurity and Biodiversity teams for employment of a staff member to assist with the Freshwater Improvement Fund Dune Lakes project pest fish work and other capacity gaps around CoastCare, lakes, and terrestrial work. In addition, a phasing problem with Photoblique quarterly payments saw one invoice from 2021-2022 charged to this year.

**Lakes Management (Ecological Monitoring):**

\$136,626. Some of this was carried forward from 2021-2022 as the NIWA lake monitoring contract was previously unable to be delivered due to COVID-19 cancellations. Two monitoring surveys were therefore delivered in 2022-2023. The project was around 6% overspent due to increasing costs in hiring divers.

**Wetland Management:** \$36,692. The contractor component was well underspent as it was used to offset an expenditure in the Biodiversity Admin contractor budget (see above).

**CoastCare:** \$47,619. This budget was around 10% overspent (expenditure of \$52,090) due to unforeseen cost increases.

**Dune Lakes:** External funding was received from the Ministry for the Environment for the Freshwater Improvement Fund Dune Lakes Project in a 50% co-funded agreement with NRC (see page 36 for further details on this project):

- Ministry for the Environment contribution 2022/23: \$183,794
- Northland Regional Council contribution 2022/23: \$183,794
- FIF Dune Lakes Project 2022-2023 budget total: \$367,588

Each year the council provides funding for fencing waterways, wetlands, and terrestrial forest habitats with the aim to support communities, tangata whenua and landowners to care for their land and water. This mahi (work) is largely administered by the Land Management team through the Environment Fund and through contracts with central government (Ministry for Primary Industries and Ministry for the Environment). We have included the funding that was used for the benefit of biodiversity during the 2022-2023 financial year.

The 2022-2023 funding year saw a total of \$366,470 of NRC Environment Fund delivered across Northland to support improved water quality and biodiversity outcomes.

**Breakdown of the Environment Fund administered by the Land Management team for biodiversity outcomes in 2022-2023.**

| Project type            | Amount    |
|-------------------------|-----------|
| Fencing waterways       | \$210,149 |
| Fencing wetlands        | \$136,284 |
| Fencing forest habitats | \$20,037  |

- **Wetland protection:** Four fencing projects to protect four of Northland's Top 150 wetlands were completed by the Land Management team in the 2022-2023 financial year, totalling \$68,995 to install 9,685m of fence. Two additional projects were withdrawn due to time and weather issues; however, the Land Management team will endeavour to get these back on track in the 2023-2024 financial year.
- **CoastCare Environment Fund:** \$40,000 (budget sat with Land Management). \$38,870 was granted and \$34,012 was spent on coastal dune restoration works. The difference was due to plant numbers delivered being much lower than what was ordered due to extreme weather conditions.
- **Terrestrial Environment Fund:** \$50,000 (budget sat with Land Management). The Terrestrial Environment Fund was previously distributed by the Biodiversity team but is now distributed by the Land Management team as it aligns more closely with their work with landowners.

| Partnership activity  | Details  | Environment Fund           |   |   |
|---|--|----------------------------|---|---|
|   |  | 2020-21                    | 2021-22                                 | 2022-23                                 |
| Council-supported programmes  | CoastCare dune restoration projects  | \$38,766                   | \$20,522                                | \$34,012                                |
| Environment Funds granted for the community                             | Terrestrial Environment Fund fencing projects (lead by the Land Management team) | \$29,492<br>4.6 km fencing | \$47,458<br>7 projects<br>8.2 kms fence | \$20,037<br>3 projects,<br>3.1 km fence |
| Ammunition supplied to landowners to control Canada geese in dune lakes | Total number of ammunition slabs issued  | 4 slabs ammo for Poutō     | 4 slabs ammo for Far North              | 6 slabs ammo for Far North              |



# Biodiversity Levels of Service

The Levels of Service listed in the Northland Regional Council's Long-Term Plan 2021 to 2031 for Biodiversity state that "Indigenous biodiversity and ecosystems are maintained and enhanced, particularly around our rivers, lakes, wetlands and coastal margins".

| Performance Measures  | Expected targets and detail   | 2021/22 Result                  |
|---|---|---------------------------------|
| <b>Number of plants provided through the CoastCare programme</b>  | <p><b>Target plant numbers:</b><br/> <b>2022/23: 15,000</b><br/>           2023/24: 16,000<br/>           2030/31: 20,000</p> <p>Plant numbers are recorded in a spreadsheet broken down to species and site for each planting season.</p> <p>The total numbers of plants each financial year are collated and added into a separate spreadsheet showing plant numbers per financial year (reported in Quarters 2 and 4).</p> | <b>16,838 plants</b> – achieved |
| <b>Number of top-ranked lakes identified in the Northland Lakes Strategy that are under active management<sup>2</sup> with stock excluded</b> | <p><b>Target number of lakes: 20</b></p> <p>The lakes are listed and ranked in the Northland Lakes Strategy.</p> <p>Monitoring records and recommendations for "active management" are recorded as part of annual lakes ecological monitoring reports undertaken by NIWA.</p>   | <b>18 lakes</b> – not achieved  |

Our largest externally funded project, the Freshwater Improvement Fund (FIF) Dune Lakes project, ran until March 2023. The expected outcomes of this project, as agreed with the Ministry for the Environment, our funding partner, is outlined in the table below.

| Project                       | Expected outcome   | Details   |
|-------------------------------|--|---|
| <b>FIF Dune Lakes project</b> | Achievement of project objectives are reported to the Ministry for the Environment each quarter. | Objectives have been met for the pest plant, pest fish, grass carp, fencing, planting, sediment mitigation and education workstreams. An extension was granted to continue work towards completion of two other workstream objectives by June 2024. |

<sup>2</sup>Active management includes basic care standards for lakes: nutrient management, ecological monitoring, submerged weed surveillance, and weed and pest control if necessary.

# 3 Mahi tahi

## Collaboration and engagement



*School students work together at Lake Taharoa to find clues on a dune lake treasure hunt during one of our dune lake education events, September 2022.*



# Bicultural Collaboration

NRC is committed to working with Māori and has recognised this as one of four areas of focus. The Biodiversity team works in many ways to develop more meaningful and enduring relationships with Māori and support their capacity to undertake work themselves and participate in decision making and exercise kaitiakitanga (guardianship). Building knowledge together is an important component of this.

The following targets demonstrate our commitment to continuous improvement in collaboration and engagement with Māori. These targets were set by our team and align with the Biosecurity Group's targets which were approved by Council and Te Taitokerau Māori and Council Working Party.

| Target   | Result   | Details  |
|--|--|--|
| <b>Bicultural collaboration</b>  | <b>Achieved</b><br>Many collaborations in 2022/23, building on at least 14 collaborations in 2021/22 | At the end of 2022-2023, the Biodiversity team had new, strengthened, and/or ongoing collaborative relationships established with hapū, whānau or iwi as follows: <ul style="list-style-type: none"> <li>• Ngāti Kuri, Te Hiku (Te Aupōuri, Ngāi Takoto, Te Rarawa), Te Roroa, Te Uri ō Hau – FIF Dune Lakes Partnership</li> <li>• Ngāti Kuri – lakes and wetland management</li> <li>• Patuharakeke Te Iwi – coastal dune monitoring and management, lakes, and wetlands</li> <li>• Ngāti Kahu o Torongāre, Nga Kaitiaki o Ngā Wai Māori – Maunga Tāika</li> <li>• Te Rarawa – dune restoration and protection at Ahipara</li> <li>• Te Whanau a Rangiwahaahu Hapū – dune restoration at Te Wairua and Otito, Matapōuri</li> <li>• Ngāti Manu, Ngāti Wai – Russell Forest baseline vegetation and bird survey with Manaaki Whenua Landcare Research</li> <li>• Ngāti Hine Forestry Trust – biodiversity surveys</li> </ul> |
| <b>Bicultural capability</b><br>All permanent staff achieved competency in Level 1 in council's Te Whāriki workshops | <b>Achieved</b>  | All staff in the Biodiversity team, including fixed term contractors, have achieved competency in Level 1 of the Te Whāriki workshops.   |
| All permanent staff will have achieved competency Level 2 in council's Te Whāriki workshops                          | <b>Ongoing</b>   | Seven out of eight staff in the Biodiversity team have achieved competency in Te Whāriki Level 2 workshops.  |
| Team members regularly contribute to and attend Kotahitanga Training   | <b>Achieved</b>  | Most staff in the Biodiversity team have attended and contributed to an internally led Māori Partnerships Workshop run specifically for our team. All staff attend regular Kotahitanga Training sessions   |



*Mahi ngātahi (collaboration) - Ngāti Kuri and NRC Biodiversity establishing Wetland Condition Index monitoring plots, Waitāhora Lagoon. Biodiversity staff will assist mana whenua to remeasure these plots in five years.*



*NRC staff supporting a Te Aho Tū Roa education event, Lake Waiporohita.*



## Biodiversity Team Māori Partnerships Workshop

A Māori Partnerships Workshop was organised by the Biodiversity and Māori Relationships teams to reflect on our progress as a team and identify areas for improvement. This led to the development of Kotahitanga Training (see below).

## Kotahitanga Training

As part of our commitment to Te Tiriti and supporting continuous improvement in our ability to work confidently and respectfully with mana whenua, the Biodiversity team has been meeting regularly with NRC's Kaiārahi Tikanga Māori (Māori Cultural Technical Advisor) to support our team's capability to facilitate successful Māori partnerships. These sessions are tailored to the team's needs around learning te reo Māori, tikanga (protocol), mihi (acknowledgements), and waiata (songs). Gaps in knowledge are addressed and staff are engaged and appreciative of this opportunity.

## New Zealand Plant Conservation Conference

A joint presentation by Biosecurity and Biodiversity staff on 'Partnerships for Better Outcomes in Te Taitokerau' was delivered at the biennial New Zealand Plant Conservation Network Conference in Queenstown. The presentation was well received. The conference theme was ecological restoration and the latest knowledge and research on plant conservation and ecological restoration in Aotearoa was shared.

Whangārei will host the next New Zealand Plant Conservation Network Conference at Forum North from Sunday 6 October to Wednesday 9 October 2024.



Staff at Tāhuna (Queenstown lakefront) during the New Zealand Plant Conservation Network Conference.





Top: Conference group learning about rare (and miniscule) alpine turf plants on a botany field trip at Tākitimu (The Remarkables)  
Middle: Dune monitoring hui with Patuharakeke and NRC staff  
Bottom: Opening a working bee with Te Whānau a Rangiwakaahu hapū and the Department of Conservation - part of an ongoing project to restore the native biodiversity of Otito Reserve at the northern end of Matapōuri.



# Events



Events are a vital part of the community engagement work carried out by the Biodiversity team. Between July 2022 and June 2023, the Biodiversity team organised, assisted with, or attended many successful events, including:

- **Dune Lake Education events at Lake Taharoa and Rotopārerā (Ruakākā Dune Lake)**
- **Te Aho Tū Roa education event at Lake Waiporohita**
- **Dargaville Field Days**
- **Parihaka BioBlitz**
- **Kaurilands Summit**
- **New Zealand Plant Conservation Network conference**
- **National Bat Hui 2023**
- **Puketitī forest health monitoring with Manaaki Whenua Landcare Research, Ministry for Primary Industries, Department of Conservation, Te Rūnanga o Ngāpuhi, and Ngāti Kahu Whangaroa Papa Hapū**
- **Balance Farm Environment Award field day (wetland presentation given)**
- **'Karanga ki uta karanga ki tai' Seaweed event at Mātihetihe Marae**
- **CoastCare organised and participated in 14 events including planting days and working bees at 8 locations**



*Dune Lake Education project lead with students at Lake Taharoa, September 2022.*

# Social Media and Media Engagement

We aim to promote the plight of Northland's biodiversity and how important it is to look after our natural world. We also let the community know what the Biodiversity team is achieving, as well as how we can support the community's efforts.

The Biodiversity team connects with the community via the council's Facebook and Instagram accounts, website, and regular media releases. Nine biodiversity-related Instagram posts were made during the 2022-2023 financial year. Thirteen Facebook posts were made, four of which related to CoastCare.

## Goal achieved

Our goal for 2022-2023 was to increase the number of social media posts, particularly around wetlands and threatened species, via a dedicated team member and NRC's Marketing and Engagement team. We achieved this goal and will continue to promote Northland's biodiversity through our social media and other channels. The target below describes how we are doing with our external engagement.

| Target   | Result                      | Details  |
|--|-----------------------------|--|
| <b>Community Engagement – social media</b><br>Total number of social media interactions maintained or is greater than the previous year. | <b>Achieved and ongoing</b> | 13 total social media outputs were shared through two channels – Facebook and Instagram (depending on the target audience and content) – resulting in a total of 22 posts – up from 5 last financial year. |

## Wetlands campaign for World Wetlands Day

In February 2023, the Biodiversity and Community Engagement teams produced a series of wetland-related content to share over the course of a week in support of World Wetlands Day (2 February 2023). An introduction video was filmed at Limeburner Creek Wetland in Whangārei and this received 1,500 views. Another short video that demonstrated how wetlands compare to sponges received 1,300 views. Across the wetland content there were 19,965 impressions (the number of times the content was displayed), 1,099 engagements (the number of interactions from viewers – e.g., likes, shares, comments), and we had a 5.5% engagement rate (the average engagement rate on Facebook is about 0.07%!). This was a very successful campaign and we hope to produce a similar result next year.



*The posts that received the most engagement during our World Wetland Day campaign*

| Post Title   | Total Engagements | Reactions | Comments | Shares | Post Link Clicks | Other Post Clicks |
|--|-------------------|-----------|----------|--------|------------------|-------------------|
| Wetland Species – focus on bittern Wetlands in Northland provide a unique habitat for... | 724               | 274       | 42       | 16     | 28               | 364               |
| Want to visit a Wetland? The National Wetlands Trust is developing a directory of...     | 143               | 36        | 4        | 4      | 20               | 79                |
| World Wetlands Day tomorrow! Northlanders are being urged to celebrate...                | 131               | 39        | 5        | 4      | 15               | 68                |



The Biodiversity team had many successful media releases during the 2022-2023 financial year:

| Date            | Post  | NRC Source   | Coverage and engagement   |
|-----------------|---|--|---|
| <b>Sep 2022</b> | Five-year dune lakes project coming to an end                   | Media Release<br>Facebook post                                 | Northern News<br>Weekend Lifestyler<br>Northern Advocate  |
| <b>Oct 2022</b> | Orchid flowering season underway                                | Media Release<br>Facebook and Instagram                        | Northern News Local Matters<br>Northland Age<br>Bay Chronicle<br>Whangārei Leader   |
| <b>Nov 2022</b> | Protecting the treasure that's our sand dunes (CoastCare)       | NRC website Media release<br>Facebook and Instagram            | Bay Chronicle<br>Whangārei Leader<br>Northern News<br>Northern Advocate<br>Northland Age<br>TVNZ<br>Local Matters<br>Kaipara Lifestyler |
|                 | Behold the backyard bat   | Media release<br>Facebook & Instagram                          | The Northern Advocate<br>Kaipara Lifestyler<br>Bay Chronicle<br>Northern News<br>Whangārei Leader<br>Stuff video feature                |
|                 | Parihaka BioBlitz   | Facebook post  | Te Hiku Media   |
| <b>Dec 2022</b> | Lisa Forester wins national award for native plant conservation | Media release<br>Facebook and Instagram                        | Northern Advocate feature<br>Scoop<br>Voxy<br>Inside Government   |
|                 | Vehicles on Dunes (CoastCare)                                   | Facebook post  |   |
|                 | Dune monitoring by summer interns comes to a close              | NRC Website<br>Our Northland                                   |   |
| <b>Feb 2023</b> | Wetlands campaign for World Wetlands Day 02/02/2023             | Media release<br>Facebook reel<br>Facebook and Instagram posts |   |
|                 | Enviroschools Encounter events for Seaweed                      | NRC Website<br>Facebook  | Scoop<br>New Zealand Herald   |
|                 | NRC 'Talk Tent' for field days                                  | NRC website  |   |
| <b>May 2023</b> | Lake Taharoa vegetation loss investigated                       | Media release<br>Facebook                                      | Scoop<br>Stuff  |
|                 | Kahikatea Berry Season  | NRC Website<br>Our Northland<br>Facebook and Instagram         |   |
|                 | Balance Farm Environment Award field day                        | NRC Website<br>Our Northland<br>Facebook                       |   |
| <b>Jun 2023</b> | CoastCare erosion and dune monitoring posts                     | Facebook and Instagram   |   |

Two bi-annual CoastCare eNewsletters were also distributed:

- 11/01/2023 - CoastCare Northland | Issue 31
- 02/06/2023 - CoastCare Northland | Issue 32

# Community Partnerships

The Biodiversity team raises community awareness and understanding of biodiversity values and the threats posed to Northland's biodiversity and encourages community action through advice and support. We support coastal dune restoration and terrestrial projects through Council's Environment Fund (EFund), as well as the control of Canada geese (*Branta canadensis*), which impact water quality in dune lakes, by supplying shotgun ammunition to licenced landowners.

## Requests and advice

The Biodiversity team logged many requests for information, advice, or assistance this financial year which represents just a small number of the total requests dealt with by the team. It is difficult to capture the exact number of requests the Biodiversity team received and responses we provided. One team member alone received at least 61 internal requests, on top of 100 external requests. Another received at least 39 requests for plant identification, 5 requests for wetland information, and two lizard identification requests.

A further 31 requests were recorded for coastal information/ CoastCare which included one incident, enquiries about erosion and other storm damage, litter on the beach, requests for plants for new projects, and reports of weeds and pests in dune areas. In addition to these external requests, advice was provided internally to Policy and Planning and Regulatory Services teams. The number also does not include most advice and requests from CoastCare groups.

The Biodiversity team provides plant identification services to the public and other teams, especially Biosecurity, via specimens or photographs sent in by email or social media. We receive identification requests on a weekly basis.

**Goal not achieved**   
(but improving)

The Biodiversity team receive hundreds of requests for advice and information, which take up a significant amount of our time. Our goal for this financial year was to better capture this effort to more accurately portray the amount of time and resource that goes into responses. During the 2022-2023 financial year we created a Biodiversity Regime in IRIS to capture requests for information, advice, or assistance that the Biodiversity team receives, following on from last year's opportunity for improvement identified in the Biodiversity Operational Report 2021-2022. However, while we improved on capturing this information in IRIS, it is still relatively difficult to represent the full extent of our team's effort in this space.



# Team training



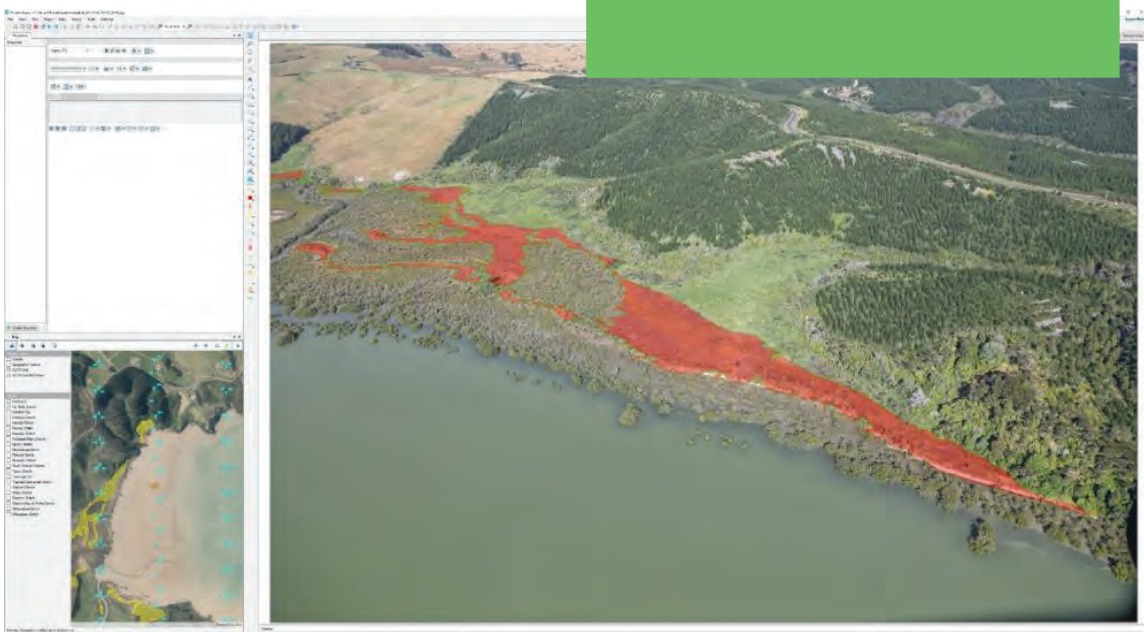
It is important that team members are capable and qualified to undertake work programmes. First Aid qualifications, water safety, and use of equipment such as kayaks, boats, and vehicles enable the team to undertake field work safely, especially around water. More technical courses such as project management and wetland delineation support specific project work.

Individual team members completed 16 relevant training courses averaging around 4 trainings each, which contributed to individual career development and ability to undertake their varied roles. Some of this training included:

- Field-based training: NIWA Fish Passage Masterclass, freediving, wetland sedge and rush identification workshop, national Bat Hui
- Internal Management Training Pathway: including courses on time management and prioritisation, project management, budgeting, and various management modules
- Communication and engagement training: media training, IAP2 Essentials of Engagement, media
- Health and Safety Training: outdoor first aid, four wheel drive, psychological safety, Mental Health 101, stress management
- Te Ao Māori: Understanding Te Tiriti o Waitangi (online), Te Whāriki Level 1 and 2, regular Kotahitanga training
- Technical skills: ArcGIS, GIS data and geoprocessing, KiEco data management
- Maritime NZ Oil Pollution Response: oiled wildlife response training for the Northland and National Oiled Wildlife Response team representatives

## Photoblique

Photoblique is a software developed and marketed by Biospatial Ltd that displays high quality, oblique aerial images that users can annotate with text and shapes, as well as other useful functions. The Photoblique contract is managed by the Biodiversity team for all NRC users. Between 1 January and 22 June 2023, 46 users of the software Photoblique across council had viewed 8,095 aerial images. The Biodiversity team generated 7% of these image views. Photoblique has proven extremely useful for our team for things like determining the location of fence lines, viewing the best access to properties, lakes, and wetlands, tracking changes in vegetation, and has helped with compliance investigations.



Screenshot of Photoblique software in use showing saltmarsh shapefile overlaid onto oblique image.

## NRC Water Street Office Planting

The Biodiversity team designed and co-ordinated planting of the NRC Water Street Office gardens with native species and showcase some of our Northland endemics and others that are rare in the region. The planting has been highly successful and is becoming well established. Biodiversity staff were also asked to design and coordinate planting of street front plantings at the NRC owned buildings at John Street, which was successfully completed before summer 2022.



*Biodiversity and other teams getting the mahi done and the plants in the ground.*



*The front gardens at the NRC Whangarei office in December 2023. Inset - before planting.*



# 4 Takutai Coastal



*Puwheke Beach, Karikari Peninsula.*

Northland has a wide diversity of coastal ecosystems, including estuaries and open coast dunes. A large proportion of original dune land has been converted to forestry and pasture. Remaining natural dunes are under threat from introduced pests and weeds, and from direct human impacts such as development and inappropriate vehicle use.

The CoastCare programme is run from within the Biodiversity team and supports local communities to protect and restore their coastal environments, with the focus being on dunes and beaches. This is achieved through partnerships between community, iwi/hapū, district councils, DOC, and NRC.

## Dune restoration works

CoastCare dune restoration work was undertaken at nearly 40 sites around Northland's coast between 2015 and 2023, with 98,000 native plants planted over that time. Most of these sites now have ongoing restoration work that includes planting, fencing, and plant and animal pest control.

Over the 2022-23 financial year 16,838 plants were planted at 17 sites through the CoastCare programme.

Planting is only one part of dune restoration. Control of pest plant species is crucial to successful dune restoration and ongoing maintenance is required. Foredune plants in particular are very intolerant of incursion from exotic species. We are seeing increasing variety of exotic species spreading into our dune areas. All CoastCare projects involve weed control via manual removal, although some CoastCare groups and hapū are trained and skilled in the use of herbicides. Contractors are also engaged to assist with this work at times.

Animal pest control is also undertaken by many CoastCare groups. Rabbit and rodent control is important for plant health as many dune plants, such as pīngao (*Ficinia spiralis*) are very susceptible to rabbit browsing and rodents eating seeds. NRC supports groups carrying out this work with advice, traps and poison.



*Fencing and planting on Marsden Village dunes, September 2022.*



*Weeding and planting at Mapere Block, Ahipara with Ahipara School, September 2022.*





Top left: Planting on Waipū Sandspit with DOC staff and volunteers, July 2022. Top right: Planting 1,000 spinifex with Mātihetihe Marae and Kura at Mitimiti, August 2022. Bottom left: Tern Point Recreation and Conservation Society Planting Day on Mangawhai Sandspit, June 2023. Bottom right: Contractor drilling and filling coastal wattle (*Acacia sophorae*) in Ruakākā.



## Coastal education and advocacy

Education and advocacy are an integral part of the CoastCare programme since most of the work is undertaken by volunteers, kaitiaki and hapū, with a large involvement from schools. In addition to planting days and working bees, events were held for Seaweek. CoastCare staff also have ongoing involvement with vehicles on beaches advocacy to reduce harm to the coastal environment.

*Rubbish collected from the dunes between Ruakākā Surf Club and the river mouth at a Seaweek event.*



## Oruaiti School partnership, Taupō Bay

We have been working with Rōpū Ngaio at Oruaiti School who have been running a project on dune restoration and shorebird protection, based on their local beach, Taupō Bay. The students ran workshops for staff and students at other schools on spinifex (*Spinifex sericeus*) and pīngao seed collection and propagation and building natural sand fences. The students also designed shorebird and dune protection posters which were made into signs and placed at the beach.



*Seed collection and litter pick-up with Oruaiti School January 2023.*



*Oruaiti School students running workshops for Peria School at Taupō Bay.*





Example of one of the signs made by Oruaiti School students.

## ‘Karanga Ki Uta, Karanga ki Tai’, Mātihetihe Marae Seaweed Event

A Seaweed event was held at Mātihetihe Marae, ‘Karanga Ki Uta, Karanga ki Tai - The Call of The Land, The Call of the Tide’. The event was organised by the CoastCare team and included staff from Biosecurity, Environmental Services and Governance and Engagement, as well as DOC and MPI. The event

included a noho marae, with the local kura and community attending on the Sunday. On the Monday, 75 students from three local schools participated in a rotation of workshops including coastal wildlife and plants, water monitoring, and pest plants.



Mātihetihe Seaweed event, April 2023.



# Dune Health Monitoring

## Dune vegetation transects

Dune monitoring provides a record of vegetation cover, native plant abundance, and pest plants, and informs ongoing dune management. This enables tangata whenua, community groups, and schools to develop their understanding of local dune ecosystems in conjunction with NRC. Vegetation transects (survey lines) are measured to give a snapshot of dune health and are used alongside drone imagery and dune profile data to monitor the outcome of restoration work like planting, pest and weed control.

Over summer 2022-2023, for the third year, the Natural Resources Science team worked with us on dune monitoring. Transects at 12 sites were measured and tangata whenua and community groups worked alongside us at some of these sites. Data was uploaded to the Coastal Restoration Trust's monitoring website: <https://monitoring.coastalrestorationtrust.org.nz>



*NRC interns measuring a dune transect at Uretiti (January 2022).*



*Patuharakeke Te Taiao staff teaching students how to conduct vegetation survey using a transect.*



## Post cyclone monitoring

Additional dune surveys were undertaken to determine the impact of Cyclone Gabrielle. The Bream Bay dune monitoring vegetation transects had been measured in December 2022 and January 2023 and some of these transects were remeasured in March 2023, post cyclone, to collect data on the cyclone's impact. The cyclone's impact varied around Bream Bay, with Bream Tail providing protection to the more southern sites and the middle of the bay having the most erosion.

At Waipū Cove dune retreat varied between two and five metres. By contrast, in the area near Ruakākā

Surf Club the retreat was up to 12.5m, and up to 17m at Uretiti. At both sites there is a relatively wide, healthy dune and there is still sufficient width of dune with good vegetation cover to rebuild. At the sites near Marsden Point the retreat was much less but the impact greater as the dunes were already very steep, weedy, less well vegetated, and in some places very narrow. We will continue to monitor and compare dune recovery at different sites. With the Natural Resources Science team, we have been talking with several research institutes on data analysis and ongoing monitoring.



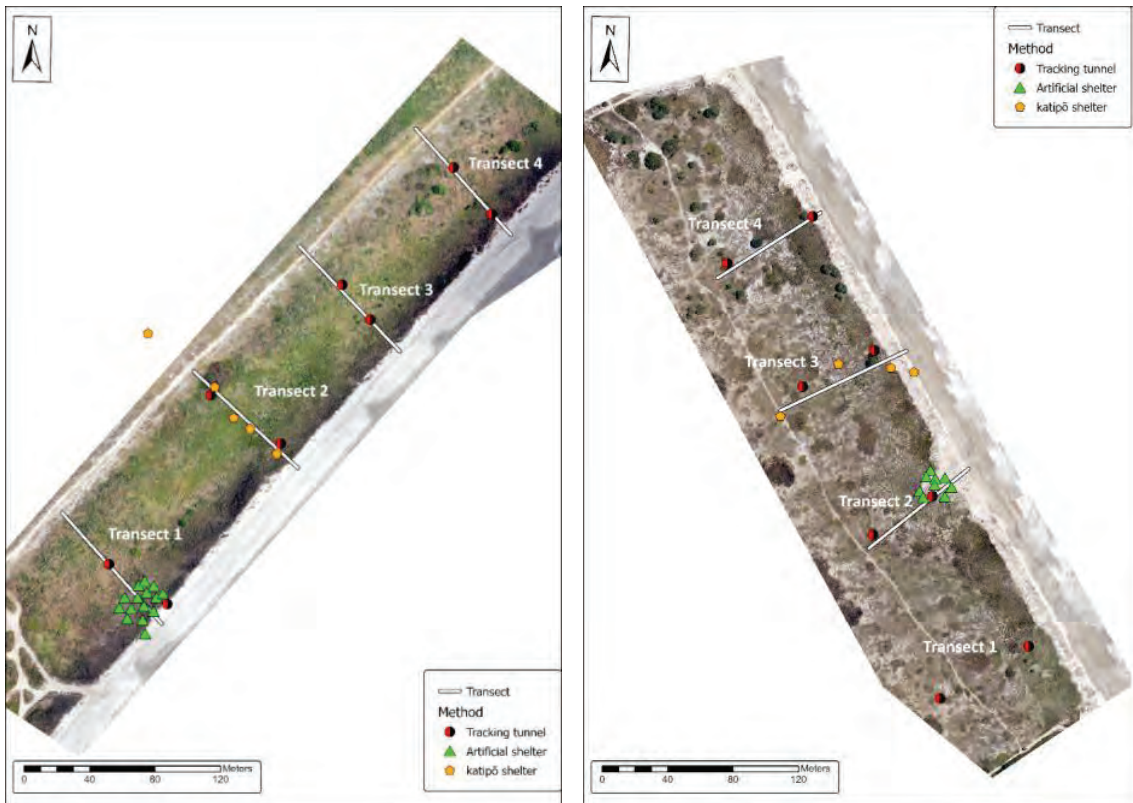
*From the beach the erosion at Ruakākā looked dramatic and at this spot, near Ruakākā Surf Club, the dune toe retreated 12.5m between early December 2022 and March 2023.*



*From the top of the dune, however, there is a healthy cover of native dune plants. As sand is blown back onto the beach and dunes this vegetation will trap it and rebuild the dune. A lot of weed control has been done in this area, improving the resilience of these dunes.*

## Drone Surveys

The Natural Resources Science team supplemented the dune monitoring with drone surveys. Drone images captured at each dune monitoring site are processed to create a high-quality, contemporary image of dune systems. This is useful for assessing vegetation cover and even detecting the presence of pest plants. The images are used to create a digital elevation model of the dune, which provides information about dune shape and profile. Regular drone flights complement field monitoring and help track changes in vegetation cover and dune structure over time. We are currently developing drone data collection and analysis methods and a workshop was held with Auckland University of Technology and NRC staff to discuss techniques and opportunities.



Examples of drone imagery, with transect lines, shelters and tracking tunnels shown (left: Mair Road, right: Waipū Wildlife Refuge)



## Fauna monitoring – Bream Bay pilot study

Over the 2022-2023 financial year, the Biodiversity and Natural Resources Science teams continued to work with Patuharakeke Te Lwi Trust Board on a pilot study in Bream Bay to monitor dune fauna. This was run alongside vegetation monitoring to get a deeper understanding of dune health and the relationships between plants and fauna in the dunes. A permit was obtained from the Department of Conservation to undertake this work as it required handling native fauna.

The study assessed the current state of dunes in places where work like pest, weed control, and planting is being undertaken, compared to areas where no work is occurring. It measured the general health of the dune system and the life in it: vegetation, birds, insects, invertebrates, and lizards.

Artificial shelters were placed in the dunes. Two sites were selected due to the limited number of shelters available and for their vegetation type suited for skink habitat. To trial which layout of shelters worked best in the dune environment two layouts were used. On the dunes near the Ruakākā Racecourse six shelters were laid along transect three at 10 metre spacing and 16

were laid in a grid pattern (4m apart in 4 lines) halfway down one of the transects. At Waipū, six shelters were laid along transect four at 10 metre spacing and the grid pattern was laid out halfway down transect two.

As well as skinks, katipō (*Latrodectus katipo*) were found in the artificial shelters so last year five timber katipō shelters were installed at each study site. The five shelters were laid out approximately 15m apart along one transect at each site.

Tracking tunnels were used across each site. They were deployed with peanut butter to detect rodents and with pear to pick up skink tracks.

Five minute bird counts were undertaken at each location on the dune ridge in the middle of the sampling site. All birds seen or heard within a 150m radius were recorded within a 5-minute period, with care taken not to record the same bird twice.

Unfortunately, Cyclone Gabrielle and other weather events caused disruption to the work. Many of the shelters were lost from erosion. It was therefore decided to continue the pilot study into 2023-24 to obtain more accurate results.



Healthy shore skink found in a shelter on a Ruakākā dune.



Patuharakeke and NRC staff checking an artificial shelter at a Marsden Point site.

## Shorebird Protection and Monitoring



CoastCare shorebird sign by fenced area at Tauranga Bay.

Many CoastCare groups are involved in work to protect the shorebirds nesting on their local beach. Threatened Northern New Zealand dotterels (*Charadrius obscurus aquilonius*) and variable oystercatchers (*Haematopus unicolor*) nest on many Northland beaches and are very vulnerable, as they usually nest on the open beach and their breeding season coincides with the busy summer period. Threats include predation of eggs and chicks, disturbance and death from vehicles and other human activities as well as loss of habitat.

We support CoastCare groups, and others, to protect our threatened shorebirds by providing signage and fencing materials.

Groups provide us with information on shorebird breeding success and presence of other wildlife. We have been working to make this information more consistent and comprehensive by providing groups with forms and maps to record dated observations. We then collate this data to obtain a better understanding of shorebird presence and breeding success around Te Taitokerau.

We are looking to get data from more sites and welcome groups and others who would like to participate to contact us at [shorebirds@nrc.govt.nz](mailto:shorebirds@nrc.govt.nz)



# CASE STUDY

## Working with hapū, kaitiaki and DOC on restoration Matapōuri Otito and Te Wairoa reserve dunes

Alongside Te Whanau a Rangiwakaahu Hapū, Matapōuri Kaitiaki, Department of Conservation (DOC) and Whangarei District Council (WDC) we supported hapū and care group aspirations to restore the natural biodiversity of the dune areas in Otito and Te Wairoa reserves in Matapōuri.

A restoration plan has been written by Matapōuri Kaitiaki with input from Biodiversity/CoastCare and Rangiwakaahu Hapū and is currently being finalised.

Several of the recommendations in the plan are already underway.

Work undertaken to date includes fencing to protect the dune area, removal of weed species and replacement with suitable, eco-sourced native plants. Several working bees were held with Rangiwakaahu Hapū, Matapōuri Kaitiaki, DOC staff and volunteers, local community members and businesses. Contractors, paid for by WDC and NRC, also undertook weed control.

Ngunguru School were also involved in the project and they have joined us each year to dig out weeds and plant native species in the Te Wairoa reserves. Alongside

this they learnt about the natural biodiversity of dunes.

Severe weather events, including Cyclone Gabrielle, caused erosion to the dune areas but this was less than in other parts of Matapouri Beach. Continuing to replace exotic vegetation with native plants will increase the resilience and function of the dunes and allow them to recover better from storm events.



*Aerial map of Matapōuri showing the approximately the areas we have been working in so far.*



# CASE STUDY *cont.*



Working bee August 2022.



July 2023 - Despite erosion a lot of the planting was still intact. Some damage was caused by people walking over the dunes when the access steps were closed due to storm damage. This area was fenced off and replanted.



Ngunguru School students, staff and whanau weeding and planting in Te Wairoa reserve.



# 5 Wai Māori Freshwater





# a. Ngā Roto | Lakes

## Freshwater Improvement Fund Dune Lakes Project

The Freshwater Improvement Fund (FIF) Dune Lakes Project was a five-year project undertaking lake restoration via workstreams which included: Māori partnerships, dune lake education, pest fish removal, pest plant control, grass carp removal, sediment mitigation, and fencing to exclude stock from lakes. The project ended in March 2023. An extension to two workstreams was granted to allow for further pest plant control and to continue hui with Māori project partners. All workstreams will be completed by June 2024.





## Māori partnerships

The FIF Dune Lakes project has facilitated good working relationships with six iwi over the course of the project. To continue developing these relationships and ensure future objectives are borne from genuine partnership, a series of hui are being held, with three completed during the 2022-2023 year.

The Māori partnerships objective is that “By 30 June 2024, partnerships will be developed to support six iwi with their own dune lake management”. At our Ngā Roto Tapokapoka Tūhono Wānanga in March 2022, iwi partners clearly stated they wanted tino rangatiratanga, sovereignty, shared planning, decision making, and delivery, with support from agencies.

NRC are holding hui with each iwi to find out how NRC can support them to achieve rangatiratanga over the roto (lakes) in their rohe. The benefits of this approach are skilled, engaged, and resourced mana whenua taking care of their dune lakes, leading to long term water quality and ecological improvements, and improved land management in lake catchments.



*Building relationships with Ngāti Kuri kaitiaki, Waitāhora Lagoon December 2022.*



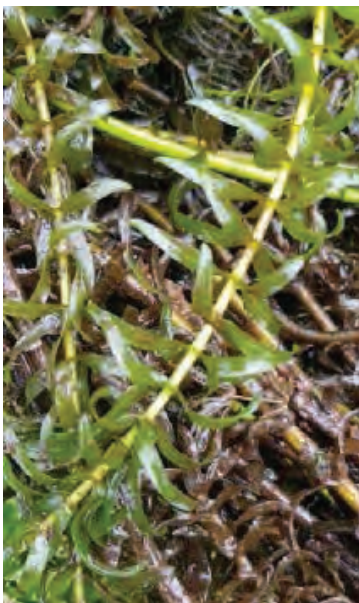
*Te Aho Tu Roa and NRC staff at one of the partnership wānanga, 2022.*

# CASE STUDY

## Ngāti Kuri partnership (FIF Dune Lakes Project)

Staff from the Biodiversity team were hosted by Ngāti Kuri to explore our partnership beyond the FIF Dune Lakes project. Ngāti Kuri goals, priorities, challenges, and solutions were discussed, and several site visits were undertaken. The wānanga successfully strengthened this important relationship, and clarity was gained around future directions.

Several Wetland Condition Index plots were established, and training undertaken in wetland monitoring techniques. This was the first in what will be an ongoing series of visits to continue to build the relationship and the capacity for both Ngāti Kuri and NRC to effectively work together for positive biodiversity outcomes.



Left to right: aquatic weed *Lagarosiphon major*; *puarangi* (*Hibiscus richardsonii*), one of two nationally critical native hibiscus species found in the Ngāti Kuri rohe; and James Ahi (mō Ngāti Kuri) using a grapnel rake sampler to look at the composition and cleanliness of submerged vegetation.



Ngāti Kuri and NRC staff members establishing Wetland Condition Index monitoring plots in the Paranoa Swamp and Waitahora Lagoon as part of our partnerships wānanga.



## Education

The FIF Dune Lakes project worked with the Enviroschools programme to engage schools close to Northland's precious dune lakes. Dune lake education events were held at Lakes Taharoa and Rotopārerā (Ruakākā Dune Lake) and 121 students attended from five schools.



*Students at Rotopārerā (Ruakākā Dune Lake) during a dune lake event, September 2022.*

Partnering with a local whānau, the English version of our popular fish identification guides was developed and expanded into a Te Reo Māori version, which reflects a Te Ao Māori perspective (Māori worldview). These cards will be used at future lake education events, particularly when working with kura kaupapa Māori (Māori-language immersion schools).

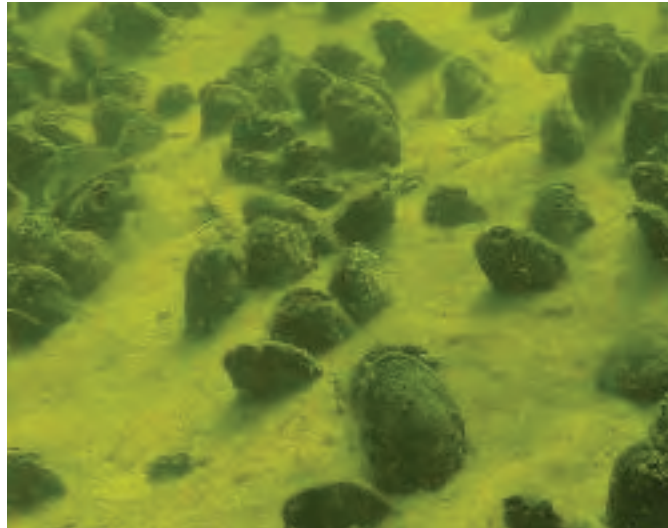


*Students use the fish identification cards during a dune lake education event to identify native fish.*

Nearly one thousand students have attended 17 dune lake education events over the five years of the project. Students now have a better understanding of the value, threats, and risks to dune lakes in their area, as well as the native flora and fauna in lakes. It is hoped this education will transfer right across the community and lead to better care of lakes by generations to come.

## Kākahi | torewai | freshwater mussel survey

A kākahi (*Echyridella menziesii*) survey was completed in March 2023 in Rotokawau and Lake Waingata (Poutō) which gave us information on the kākahi (also known as torewai/freshwater mussels) population structure and lake health. We now have information to discuss with the lake owners about the state of the kākahi populations in the two lakes. See the case study on page 51 for more information on these unique creatures.



Dense kākahi beds in Rotokawau, Poutō.

## Aquatic weed control

Hornwort (*Ceratophyllum demersum*) is an extremely invasive aquatic plant that can form surface-reaching beds which smother native aquatic plants. Thick mats of hornwort block light to the bottom of the lake where other vegetation then dies due to a lack of sunlight. The decaying vegetation breaks down which removes available oxygen from the water and can cause release of nutrients from sediments and triggering a lake to flip to a degraded, algal-dominated state. Hornwort has been found in several lakes in Northland and control with herbicide began in 2021 through the FIF Dune Lakes project.

To ensure the greatest chance of hornwort eradication, Reglone® (Diquat) herbicide was applied via kayak to Lakes Tutaki, Egg, and Mt Camel North in 2021 to provide an initial knockdown. The lakes were then treated with Endothall (Aquathol K) by helicopter (Lakes Tutaki, Egg, and Karaka, all in Poutō) by kayak application (Mt Camel North, Houhora). Water quality monitoring and by-kill surveys were undertaken 48 hours after the application with no adverse impacts observed.

During follow up surveys, no hornwort was found in Lakes Tutaki and Egg, which is a promising result. These lakes will be surveyed again in summer 2024,

and, if need be, another herbicide application will be undertaken in late summer 2024. If by 2028 no hornwort has been found, we can declare a successful eradication from these two lakes.

Post-herbicide monitoring in Lake Karaka and Lake Mt Camel North found only reduced levels of hornwort so these lakes will need to be treated again in the summer of 2024.

We still hope to control hornwort in Lake Mt Camel South if and when the outlet stops flowing to the sea in summer 2023/2024, as well as the Lake Tutaki Southern Pond when the track dries and allows for access.

Aquatic weeds have now been controlled using herbicide in six lakes since the beginning of the FIF Dune Lakes project. Lagarosiphon (*Lagarosiphon major*) has not been found in Lake Ngatu since herbicide control took place in 2020. We will continue surveying Lake Ngatu until 2025 to confirm eradication.





*Skyworks Helicopters Agricultural Ltd loading herbicide to treat hornwort in three lakes on the Poutō Peninsula, March 2023.*

## **Pest fish**

201 tench were removed from Lake Kapoai in October 2022. This brings the total number of tench removed from this lake to 6,471 during the FIF Dune Lakes project. The Biosecurity team hopes to continue our progress by partnering with mana whenua to remove pest fish in this lake and others across Te Taitokerau.



*Adult tench caught from Lake Kapoai.*



*Biodiversity staff with an adult tench from Lake Kapoai.*

Eleven pest fishing events were undertaken over six years and at six lakes under the FIF Dune Lakes project. A total of 28,625 pest fish were removed from these lakes. Methods included electrofishing, using Gee minnow traps, trammel nets and gill nets, and baiting with an automatic feeder.

## Grass carp removal

### Roto-otuauru / Lake Swan

Approximately 800 grass carp (*Ctenopharyngodon idella*) were released into Roto-otuauru/Lake Swan on the Poutō Peninsula in 2009 to control two invasive weeds: egeria (*Egeria densa*) and hornwort. Since this time, the fish have eaten all submerged macrophytes from the lake, including native plants. Grass carp are able to live over 25 years in Northland. NRC are reducing the number of grass carp at Roto-otuauru to allow native macrophytes to recolonise and restore the lake to a more natural state.

Twenty-two grass carp were removed from Roto-otuauru during fishing operations in 2022/23, bringing the total number of carp manually removed by NRC to 105 (13% of the original number released). An automated fish feeder was trialled to habituate grass carp to gathering at the feeder at this lake and also at Wai Te Huahua (Lake Heather, Awanui) to improve our catch rate.



Automatic fish feeder installed at Roto-otuauru. Note the dorsal fin of a grass carp below the feeder creating ripples.

Some fishing efforts produced better results than others. For example, our first attempt at Roto-otuauru caught 36 grass carp over four days, while the latest attempt caught only 11 fish over three days. This demonstrates the difficulties of capturing grass carp – they are clever, big, and spook easily. Despite this, it is useful to keep reducing grass carp numbers each year to improve water quality and refine our methods.

Grass carp removal will continue at Roto-otuauru and Wai Te Huahua past the end of the FIF Dune Lake project. Grass carp do not breed in New Zealand lakes therefore we have the opportunity to reduce their numbers to such levels that native submerged plant species can recolonise, which in turn will improve water quality and restore lake ecosystems.

TLI (trophic level index) is monitored quarterly for each of these lakes. TLI scores are calculated using four separate water quality measurements – total nitrogen, total phosphorus, water clarity, and chlorophyll a. Nitrogen and phosphorus are key nutrients that algae and plants thrive on, thus creating the perfect conditions for algal blooms. TLI scores in the lakes with grass carp have not improved yet but are expected to decrease over time as more carp are removed from the lake, demonstrating improving water quality.





*Setting grass carp nets at Roto-otuauru.*



*Grass carp captured from Roto-otuauru.*



*Southern margin of Roto-otuauru showing margins which were devegetated by grass carp.*



### Wai Te Huahua (Lake Heather)

Wai Te Huahua is a 10.76ha dune lake situated near Awanui in the Far North. About 400 grass carp were released here in June 2010 to control the invasive aquatic weeds egeria and hornwort. This was considered crucial to prevent the spread of these weeds to other nearby dune lakes. By 2014, only fragments of the weeds were found, and the lake is now devegetated.

Twelve grass carp were removed under the FIF Dune Lakes project by NRC and Ngāi Takoto Kaitiaki Rangers, where kaitiaki learnt and practised the skills to remove grass carp from their lake. This brings the total number of carp manually removed by NRC to 36 (9% of the original number released).



Team effort between NRC staff and Ngāi Takoto Kaitiaki Rangers at Wai Te Huahua to catch grass carp.

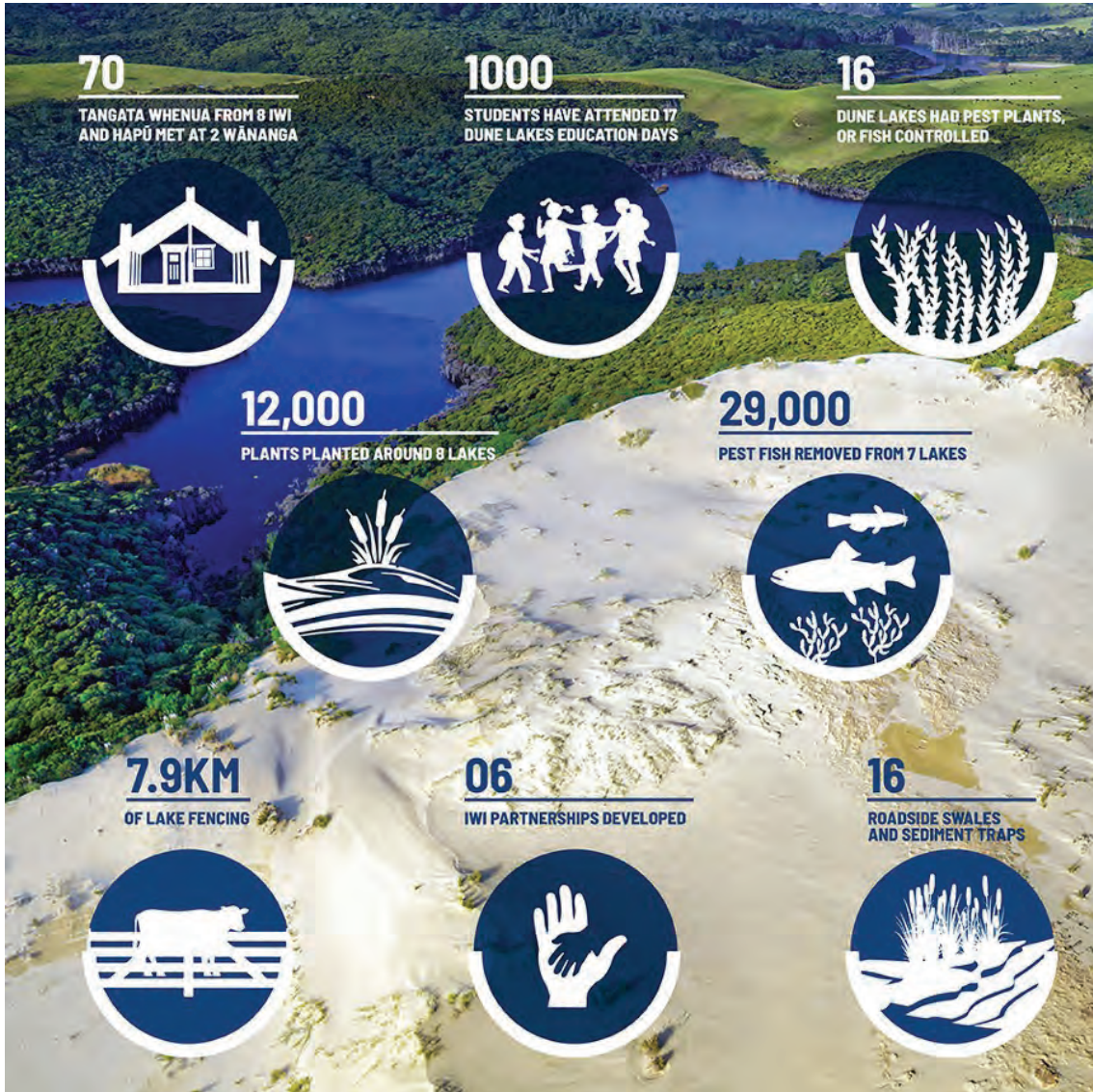
### Planting

The FIF project supplied 2,250 plants to Ngāi Takoto iwi to put in the ground at Lake Waiparera in August 2022. Another 3,288 plants were delivered to Lakeland Station (Kai Iwi lakes) for planting in the wetlands around Black Lake by the landowners in May 2023.

### Sediment mitigation

A wetland construction feasibility study was undertaken at Black Lake on Lakeland Station, Kai Iwi Lakes, but estimated costs were well above the available budget, so this project did not proceed. Native wetland plants were provided to Lakeland Station instead and these were planted around Black Lake.





Summary of the Freshwater Improvement Fund Dune Lakes project key achievements between 2018 and 2023.

## Lake ecological surveys and monitoring

NRC has conducted annual ecological surveys and monitoring of lakes since 2001 to obtain data on lake ecological health and status over time. Around 100 lakes are monitored every 5 years on a rotating basis. This programme compliments regular lake water quality monitoring and meets the requirements of the National Policy Statement for Freshwater 2020 for regional reporting on ecosystem health and compulsory attributes of freshwater bodies.

Field assessments have involved a team of NIWA, NRC, and Department of Conservation (DOC) aquatic and wetland botanists and ecologists, and iwi/hapū partners and/or landowners. Lakes are assessed for endangered species, wetland and emergent vegetation extent and species composition, submerged vegetation abundance and composition of submerged plants, including a LakeSPI (Submerged Plant Index) assessment where feasible, and bird,

fish, and aquatic invertebrate presence. Lake report cards are produced after each survey which form the basis of a lake-specific risk matrix, identifying values, threats, and management options.

LakeSPI is a transect-based national method of assessing the abundance and health of submerged plant vegetation in lakes developed by NIWA. Divers assess the depth, height, density, and abundance of native and pest plant to assign health scores<sup>3</sup>.

Twelve lakes were visited in March 2023 during the annual lakes ecological survey week with NIWA, mana whenua and landowners. No lagarosiphon was found in Lake Ngatu after it was controlled with herbicide in 2020. After the wet summer lake levels had restored and there were good populations of the rare native plant *Trithuria inconspicua* in the shallow sand margins of at Lake Ngatu.



Biodiversity and NIWA staff at Lake Taeore during the 2023 lakes survey.

<sup>3</sup> LakeSPI is carried out using scuba diving to record key information features about aquatic plant structure and composition within a lake. Survey data is then used to generate three LakeSPI indices:

- Native Condition Index, which characterises the status of native vegetation within a lake.
- Invasive Impact Index, which captures the degree of impact from invasive weed species.
- LakeSPI Index, which provides an overall indicator of lake ecological condition.

A high Native Condition Index is favourable, while a high Invasive Impact index is undesirable. The higher the LakeSPI index, the better the overall health of the lake. For ease of reporting LakeSPI status, lakes are also classified into five lake categories according to the value of the LakeSPI Index: Excellent, High, Moderate, Poor, Non-vegetated. These categories support an MfE initiative for better national consistency in terminology and reporting. For more information see [niwa.co.nz](http://niwa.co.nz).

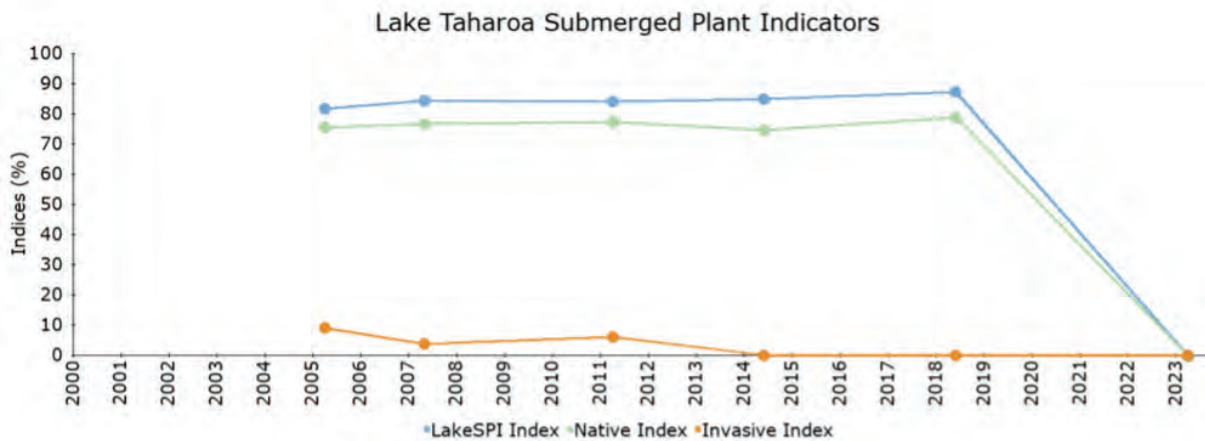


# CASE STUDY

## Lake Taharoa submerged vegetation loss investigation

During the lakes ecological survey by NIWA divers, submerged vegetation in Lake Taharoa was found to have dramatically declined. Lake Taharoa is the deepest and second largest lake in Northland (after Lake Ōmāpere). It has had the deepest growing lake vegetation in Northland, ranging between 18 to 27.5m during the eight surveys since 1984. However, in March 2023, there was not enough vegetation to give a Lake Submerged Plant Index (LakeSPI) result. The LakeSPI score dropped from 87% (Excellent = A band) in 2018 to 1.8% (Poor = D band) in 2023. More than 10% plant cover is needed to generate a LakeSPI score, so currently the lake is classed as “Devegetated”.

Two nearby lakes, Kai Iwi and Waikare, were found to have ‘Excellent’ submerged plant scores, continuing that trend from at least 2005.



| Survey Date | Status        | LakeSPI % | Native Condition % | Invasive Impact % |
|-------------|---------------|-----------|--------------------|-------------------|
| March 2023  | Non-vegetated | 0.0%      | 0.0%               | 0.0%              |
| May 2018    | Excellent     | 87.2%     | 78.7%              | 0.0%              |
| May 2014    | Excellent     | 84.8%     | 74.7%              | 0.0%              |
| March 2011  | Excellent     | 84.0%     | 77.3%              | 5.9%              |
| April 2007  | Excellent     | 84.4%     | 76.7%              | 3.7%              |
| March 2005  | Excellent     | 81.6%     | 75.3%              | 8.9%              |

LakeSPI scores for Lake Taharoa between 2005 and 2023.

Initial analysis of water quality and water level data from NRC's Monitoring team did not show any obvious links to the decline although NIWA suggested a link between water clarity, declining water quality, and very low water levels. In addition NIWA suggested that there could be impacts of high summer rain fall events and Cyclone Gabrielle (one month prior to monitoring), as well as the cumulative impacts of visitor usage (over 1,000 visitors per day and campers, powerboating, jet skis, swimmers, etc.).

In early 2022, Lake Taharoa experienced the lowest water level since 1995. A report by the NRC Science team found the low water level was driven by an imbalance of rainfall and lake evaporation despite the region experiencing a wet summer in 2022/23. Evaporative water loss has increased since 2003 because of dry weather, while rainfall over the lake has decreased since 1986. Lake Taharoa has a large surface area (approximately half of the lake catchment area) resulting in large volumes of water lost to the atmosphere via the evaporation process.

Further investigation by the NRC Monitoring team discovered Lake Taharoa was thermally stratified and the hypolimnetic (lower level in the water column) dissolved oxygen (DO) was dropping by October 2022, reaching zero in mid-January 2023.

Thermal stratification is when bodies of water "divide" into distinct layers of density due to different temperatures with cold water sitting in the lower level. The hypolimnetic DO was zero for three months over summer and the thermocline was at around 25m depth. This could also have contributed to the dieback of bottom dwelling plants which resulted in the lake devegetating.

Next steps are to:

- Install a continuous monitoring buoy to gather more water quality data,
- Identify information and analysis gaps – cost out, report on, and address issues, if possible,
- Conduct another annual LakeSPI survey in conjunction with an annual weed surveillance survey,
- Investigate recent actions/events in the catchment (e.g., pine logging, fertiliser use),
- Establish operational meetings with Kaipara District Council, Te Roroa, Te Kuihi and DOC

Reports on each NIWA survey are available on the Northland Regional Council website <https://www.nrc.govt.nz/resource-library-summary/research-and-reports/lakes/lake-ecological-reports/>



*Change in native submerged vegetation in Lake Taharoa between 2007 and 2023.*



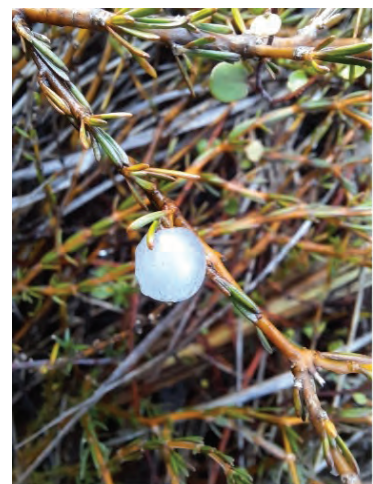
## Annual lake aquatic weed surveillance

Four high value lakes are surveyed annually at high-risk areas like public entry points for aquatic weeds. Commercial divers and NRC snorkelers search for submerged aquatic weeds like hornwort and oxygen weeds. Although this is technically biosecurity surveillance, it is efficient for the Biodiversity team to organise this work as part of our usual lake monitoring programme. In addition, during regular ecological and LakeSPI surveys, submerged weeds are looked out for. This has resulted in several successful weed eradication programmes using grass carp or herbicide. Identifying incursions in their early stages gives the best chance of achieving eradication success.

The annual Check, Clean, Dry programme run by the Biosecurity team is a freshwater pest awareness campaign led and funded by the Ministry for Primary Industries (MPI) which aims at preventing the spread of freshwater pests between waterways. This programme compliments the Biodiversity team's pest surveillance and ecological survey work.<sup>4</sup>



Lakes Ecological Survey crew from NRC and NIWA at Lake Mokeno, Poutō Peninsula.



Left: Working with Ngāi Takoto iwi at Lake Ngatu during the Lakes Ecological Survey. Middle: *Kunzea amathicola*, a species of kānuka found mainly on shifting, sandy soils on the west coast. This photo was taken at Poutō Peninsula during the lakes survey where it is abundant, however it is considered Threatened – Nationally Vulnerable. Right: Tātaraheke/sand coprosma (*Coprosma acerosa*). This species is also abundant in Poutō however is classified as At Risk – Declining.

<sup>4</sup> For more information on Northland Regional Council's freshwater pest programme please see the Northland Regional Pest and Marine Pathway Management Plan 2017 - 2027

## Rotokawau egeria removal

Divers spent two days hand weeding egeria at Rotokawau in December 2022. The egeria patches began at a depth of 1.5m around where a band of kākahi (freshwater mussels) occur and was observed at depths no deeper than 5m. Egeria generally grows fairly shallow down to a depth of around 7m. This is probably because the shallow water allows for greater light penetration which egeria requires for growth. The patches of egeria were highly concentrated within the upper three metres of the lake, so the divers focused mostly on this area. It was evident that the egeria had begun to compete with native submerged plants as it was growing up through some of the charophyte meadows.

More egeria removal work will be conducted by divers over the 2023-2024 summer.

### Lessons from this first weeding effort include:

- The work would be more manageable if there was a larger support team top side and at least one more SCUBA buddy pair,
- Set up a shore team on the banks of the eastern lake side with multiple catch/mesh bags to create a quick change over of bags for the divers,
- Based on the efforts from December 2022, approximately four days with at least four divers would be necessary to complete the harvest.



Top: Eel (*Anguilla* sp.) in Rotokawau.

Bottom: A healthy native charophyte bed in Rotokawau.



# CASE STUDY

## Rotokawau and Lake Waingata kākahi surveys

Kākahi (freshwater mussels, also known as torewai in Te Taitokerau) are a taonga to Māori and an important indicator of lake health. New Zealand has three species of kākahi, all in the *Echyridella* genus. The most common kākahi species found in Northland, *Echyridella menziesii*, are classified as "At Risk - Declining". NRC have little population data on kākahi populations in Te Taitokerau.

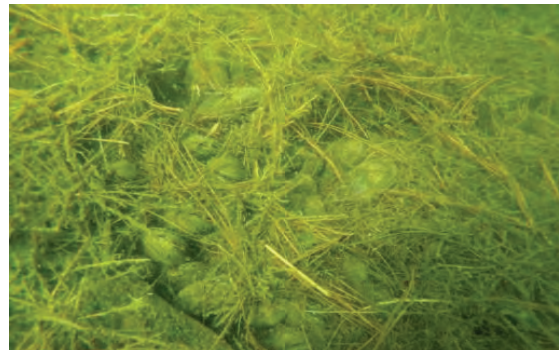
Kākahi are important to lake health as they filter water and remove nutrients, algae, bacteria, and fine organic material. Each mussel can filter up to one litre of water per hour. Mature adults typically range from 60 - 84mm in length but can reach sizes over 100mm. Their average life expectancy is 20-25 years but under ideal conditions they can live over 50 years. Kākahi have an unusual reproduction cycle where they rely on native fish to transport their glochidia (baby mussels) throughout a waterbody, therefore, understanding how kākahi populations are doing also gives us an indication of fish population health.

A kākahi survey at Rotokawau and Lake Waingata (Poutō) was completed in March 2023 and gave us information on population structure. Almost 99% of the mussels in Lake Rotokawau were considered adults (>40mm) which is indicative of limited to no successful recent recruitment. The issue is that if any environmental changes were to occur that result in high mussel mortalities, the ability of the existing populations to recover is limited.

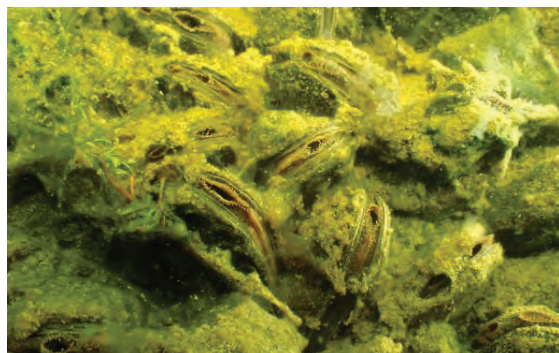
In contrast, about 75% of the kākahi in Lake Waingata were adults, with the remaining 25% in juvenile size classes. This size class distribution is indicative of successful recent recruitment in Waingata, which is positive. The average density of the kākahi beds in Rotokawau were 140 mussels per square metre but just three mussels per square meter in Waingata. Densities exceeding 600 live mussels per square meter have been reported in other New Zealand lakes.

An immediate threat to the Rotokawau kākahi was the accumulation of pine needles, sediment, and other organic debris that were deposited on top of the mussels during Cyclone Gabrielle and other high rainfall events in early 2023. DOC later funded the relocation of some mussels to other parts of the lake clear of the organic material.

Undertaking kākahi population studies allows us to understand the state of the mussels and some of the pressures the kākahi face. We now have information to discuss with the lake owners about the health of kākahi in these two lakes. Further investigation is required to determine why recruitment is not occurring in Rotokawau and to find ways to improve lake health, which should lead to better long-term outcomes for the kākahi.



*Kākahi bed covered in pine needles in Rotokawau following Cyclone Gabrielle.*



*Kākahi in Rotokawau smothered by benthic algal growth during the March 2023 survey.*



*Adult kākahi beds in Rotokawau.*

## b. Ngā Repo | Wetlands

Originally, 35% of Northland was wetland, totalling 453,251 ha. Wetlands in Northland have been significantly reduced, mainly by draining and land development, to 14,291 ha – only 3.2% of the original area<sup>5</sup>. This is much lower than the national figure of ~10%. Lowland and coastal wetlands, especially in southern Northland, were the most impacted. Much of the remaining wetland area is in the Far North.

Around 75% of our wetlands are smaller than 10ha and only three are larger than 500ha. Many of the remaining wetlands are degraded, and drainage, pests, weeds, and climate change remain their biggest threats. The current crisis is not just about the loss of area but about the loss and degradation of our unique and irreplaceable wetlands which contain rare native wetland plants and animals. Species like the Australasian bittern (*Botaurus poiciloptilus*) and Northland mudfish (*Neochanna heleioides*) rely on wetlands.

The Biodiversity team coordinates wetland work across council and provides expert technical advice to council's Compliance, Consent and Policy and Planning teams. In the 2022-2023 financial year, Biodiversity staff provided advice to the Planning and Policy team for the Proposed Regional Plan for mangrove removal and significant ecological area appeals.

Biodiversity staff have also been part of the Planning and Policy team's staff expert group for developing the freshwater plan change that is required to meet the requirements of the National Policy Statement for Freshwater Management (NPS-FM). During 2022-2023, two biodiversity staff assisted with preparing evidence for a wetland prosecution which is still ongoing.



Figure 1. Historic wetlands (c. 1840) of Northland Region Ecological Districts.



Figure 2. Current wetlands of Northland Region Ecological Districts.

<sup>5</sup>Figures for wetland area from Clarkson B R, Price R J 2022: A framework for monitoring Northland wetlands. Prepared for Northland Regional Council Manaaki Whenua Landcare Research. Envirolink Grant: 2205-NLRC228



We are carrying out wetland condition outcome monitoring and developing a state of the environment (SOE) programme. As part of the SOE and wetland monitoring programmes, Biodiversity staff will use ESRI-Field Maps based apps for carrying out condition monitoring and wetland delineation, based on standard methodology<sup>6,7</sup>. A list of Northland wetland plants has been compiled for these programmes.

Biodiversity staff have continued to carry out monitoring and survey of wetlands to provide advice to landowners on looking after their wetlands.

### Opportunity: Wetland delineation – Progress on capability gap

The National Policy Statement for Freshwater Management (NPS-FM) has a focus on preventing further loss of natural wetlands and the ability to identify these wetlands is required for the implementation of this policy. The identified gap within council around the technical capacity and capability of field staff to delineate wetlands using the national protocol is being addressed. We have made significant progress addressing this gap through input from experienced Biodiversity staff delivering in house training for wetland plant identification and wetland delineation, as detailed below.

## Wetland sedge and rush identification training

Wetland plant identification training was delivered at Te Pūkenga/NorthTec for staff from Biodiversity, Biosecurity, Compliance Monitoring, Land Management, Whitebait Connection, and Ngāti Kahu o Torongāre. A Biodiversity team botanist and wetland expert gave a presentation on wetland types in Te Taitokerau and participants learnt to identify wetland plants using sedge and rush identification keys. Staff have a need for skill development in this area and a wetland education series aiming to give staff enough plant identification skills to undertake wetland delineation using the NPS-FM methodology is planned for late 2023.



Introducing the wetland types found in Te Taitokerau, and some of their characteristic inhabitants.



Students learning to use the NIWA sedge and rush identification tools.

<sup>6</sup>Clarkson BR, Sorrell BK, Reeves PN, Champion PD, Partridge TR, Clarkson BD 2004. Handbook for monitoring wetland condition. Coordinated Monitoring of New Zealand Wetlands. Ministry for the Environment Sustainable Management Fund Project 5105.

<sup>7</sup> Ministry for the Environment. 2022. Wetland delineation protocols. Wellington: Ministry for the Environment.

## Wetland protection via fencing

Four fencing projects were completed in the 2022-2023 financial year, totalling \$68,995 for 9,685m of fence to protect four of Northland's Top 154 ranked wetlands. Two additional projects were withdrawn due to time and weather issues. However, the Land Management team will endeavour to get these withdrawn projects back on track in the 2023-2024 financial year.

## Wetland monitoring

### State of the Environment Wetland Monitoring

A comprehensive state of the environment wetland monitoring programme has been designed to meet the requirements of the National Policy Statement for Freshwater Management and provides a framework for monitoring the ecological state and extent of Te Taitokerau's freshwater wetlands. The representative set of an initial 61 wetlands includes the top 30 ranked wetlands, as well as the 32 wetlands monitored in our wetland condition index (WCI) outcome monitoring programme. The programme will be further developed and implemented during the coming year, through refining and updating vegetation type extent information and designation of monitoring plots within each selected wetland. Having accurate, up-to-date wetland maps will be an important component of the programme. The development and refinement of the monitoring methodology for use nationally is being led by MfE and a regional council special interest group, which Biodiversity staff are involved in.



*Kerikeri inlet near Waitangi Wetlands with a nice example of a repositing from freshwater to saltmarsh and mangroves*

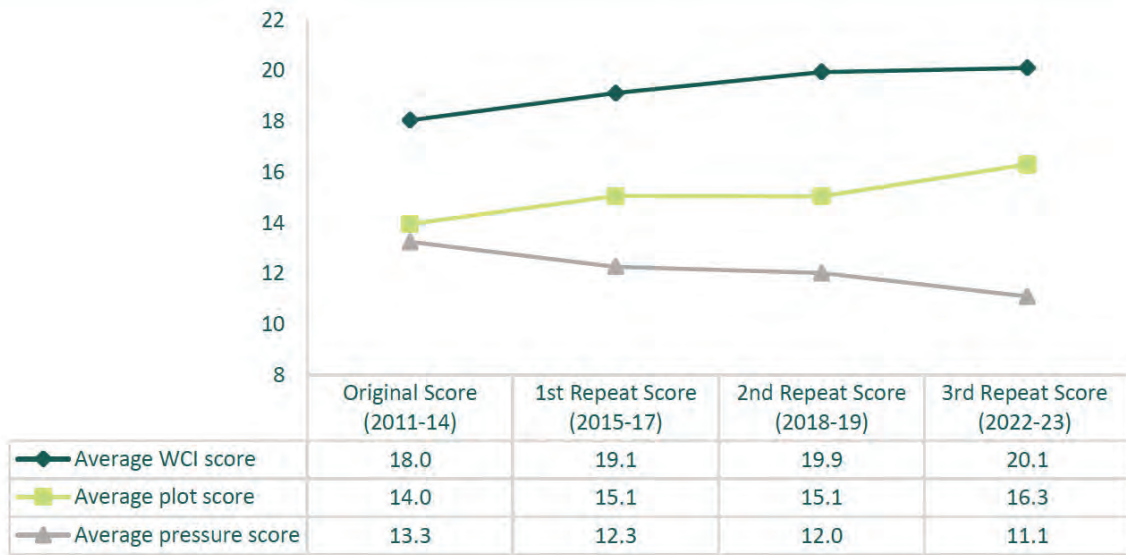
### Wetland Condition Index

The existing wetland condition outcome monitoring programme that started in 2011 is now a component of the wetland monitoring framework and the fourth round of monitoring was completed in 2023. In this programme, the Biodiversity team monitors the health of wetlands using the national Wetland Condition Index (WCI) system. This monitoring methodology tracks changes in wetland condition over time, based on assessments of hydrology (wetness), soils, ecosystem intactness, and dominance of native biota, and will be the basis for on-going SOE wetland monitoring. A range of wetland types (swamps, fens, gumlands and seeps) are incorporated into our WCI network.

WCI outcome monitoring started in 2011 with 28 wetlands on 18 properties, most of which were fenced with funding support through the Environment Fund (EFund). This programme has expanded since 2020 to cover 32 wetlands with a range of baseline states. The wetlands are monitored every three to five years.

The fourth cycle of monitoring of the original 28 wetlands began during 2022 and was completed in 2023. Results from the four rounds of monitoring have shown that most degraded wetlands improved their scores and the wetlands in good condition remained stable.





Improvement in overall wetland condition shown by improving wetland and plot scores and decreasing pressure scores for WCI monitoring of all plots from 2011 to 2023.



Example of improvement in condition of wetland vegetation from just after the wetland was fenced in February 2014 to the fourth monitoring visit in March 2022



## Wetland mapping

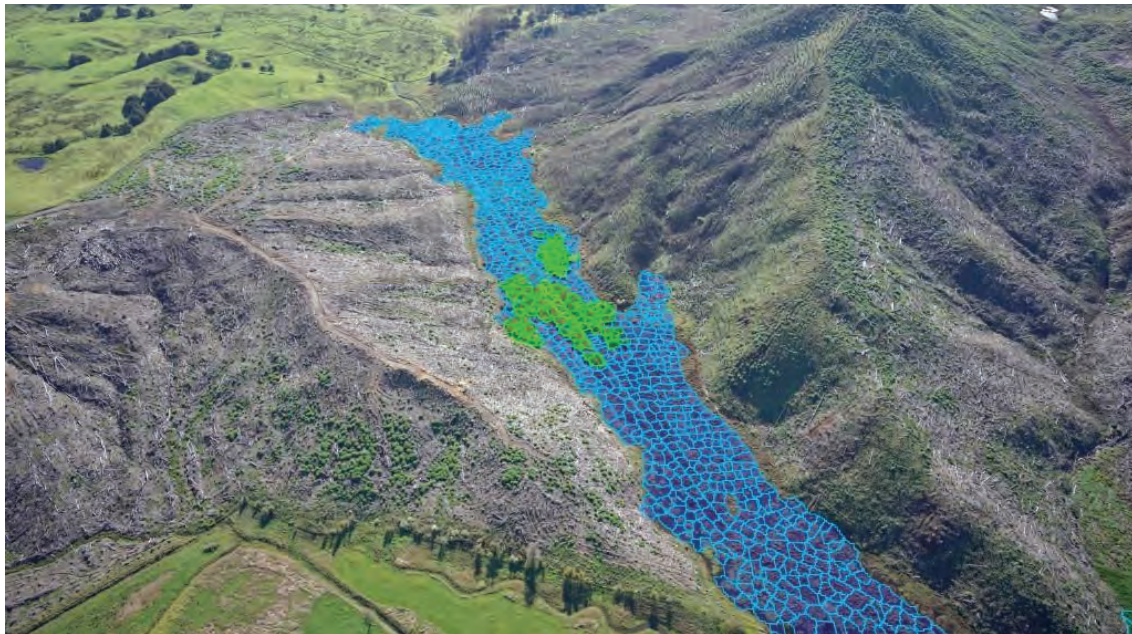
A comprehensive wetland mapping project has been underway since 2021-2022. The project is led by NRC's Policy and Planning team in partnership with the Kaipara Moana Remediation (KMR) Programme. A range of NRC staff are involved in the project, including essential wetland specialist advice from the Biodiversity team on the accuracy and precision of a range of trial mapping methods and validation of final map layers. The final product is due to deliver comprehensive spatial extent of the region's wetlands, including some wetland classifications (freshwater, gumland and swamp forest) and condition attributes such as stock access and presence of drainage. This will form a base data set and inventory for capturing changes in extent and condition, as well as validation of wetlands where remote methods are inconclusive. The wetland mapping and attribute data (wetland inventory) will be continuously updated as new information and field data is gathered. The inventory will help council implement the NPS-FM protection, management and restoration provisions and inform council's regulatory,

monitoring, and compliance functions. Council will use the inventory along with aerial oblique images and other spatial data.

### Outputs from the project include the following regional spatial layers:

- Saltmarsh and mangrove habitat
- A coastline that distinguishes between inland freshwater wetlands and saline wetlands
- Inland wetlands – excluding wet heathlands, e.g., gumland and swamp forest
- Wet heathland
- Swamp forest
- Ponds/waterbodies
- Historic imagery

The mapping is likely to identify approximately 50,000 wetlands over 500m<sup>2</sup> and most of these will probably meet NPS-FM natural inland wetland and regional plan wetland definitions.



Example of wetland polygons (blue and green; where polygons are attributed to either harakeke/flax) overlaid to wetland locations in Photoblique (BioSpatial Ltd).

## Landowner site visits, advice, and plans

Four landowners have received wetland advice including for Waitangi Wetland, Arethusa Wetland, Hurupaki School, and a Far North District Council subdivision. Several compliance site visits were also completed (Ngawai & Maitahi).



## Parliamentary Commissioner for the Environment: Integrated Landscape modelling project

Staff attended a site visit to the Hikurangi repo and hui with the Parliamentary Commissioner for the Environment (PCE), Simon Upton. This was the initial scoping visit for the PCE Integrated Landscape modelling project involving the case study catchment, the Northern Wairoa. The investigation looked into how the Government’s current policies for tackling climate change, freshwater quality and biodiversity are shaping Aotearoa’s landscapes, and the extent to which a more joined-up, landscape-based approach could help to improve the quality of the environment. This ‘thought experiment’ involved engagement with tangata whenua, agriculture, and forestry sectors, and other local people from the catchment to inform the thinking around better ways of responding to land-based sources of environmental pressure. The final report is due to be released in November 2023.

## National Wetland Trust – Northland Wetland Symposium

The National Wetland Trust is a registered charitable trust established in 1999 to increase the appreciation of wetlands and their values by all New Zealanders.

Biodiversity staff are thrilled to be hosting the three-day biennial National Wetland Trust Symposium in Te Taitokerau, at the Copthorne Hotel, Paihia, on 10-12 April 2024 for around 250 delegates from all over New Zealand. This will be the Trust’s first in-person conference since 2018. Biodiversity and Māori Engagement team staff are on the organising committee, with one of the Biodiversity staff chairing the committee, and one of the team members a National Wetland Trustee. The symposium will be a great opportunity for connecting landowners, kaitiaki, and scientists and to showcase local projects, learnings, people, and wetlands.

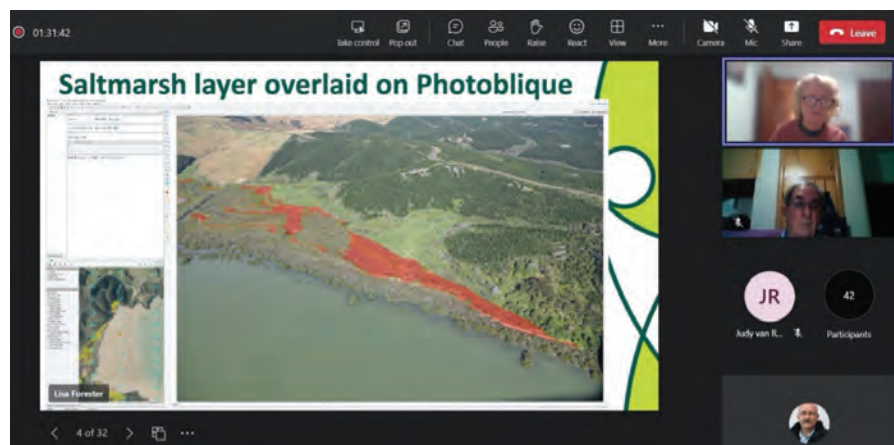


Abstract submissions open until 23 November 2023

[www.wetlandtrust.org.nz/what-we-do/symposia](http://www.wetlandtrust.org.nz/what-we-do/symposia)



Staff delivering an online presentation on Northland’s wetlands to the National Wetlands Trust at their Annual General Meeting.



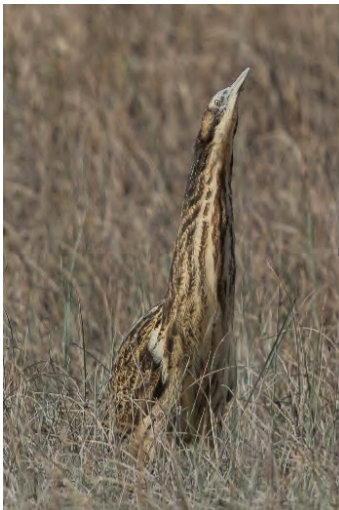
## Australasian bittern records and monitoring

A web page to capture the public's matuku-hūrepo/ Australasian bittern sightings was created with the help of NRC's Community Engagement team. A total of 15 records were recorded in the 2022-2023 financial year – the first of which occurred within days of the website going live! This is an exciting opportunity to involve the public in reporting bittern sightings and to promote the conservation of these birds through information on our website.

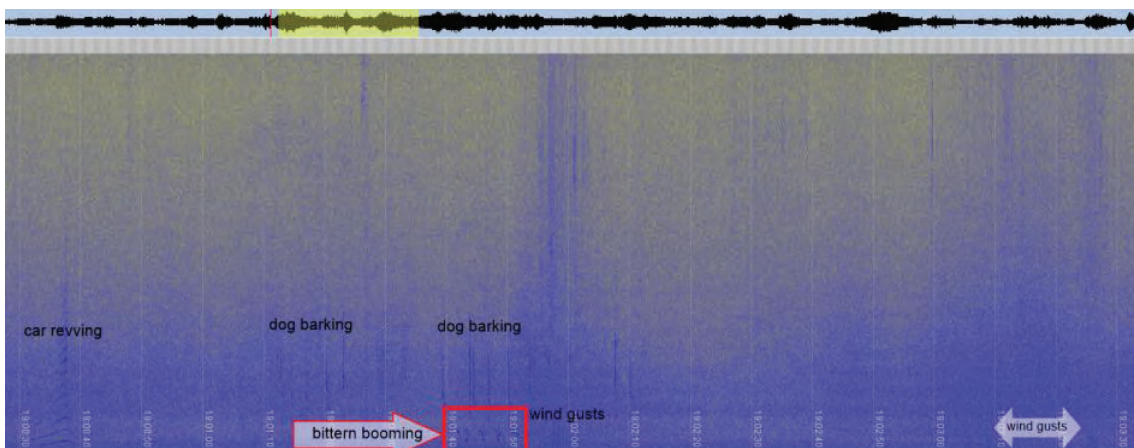
The Biodiversity team plans to collaborate with Auckland Council in the next financial year to roll out a bittern monitoring programme on the southern boundary of Northland. Initial discussions with

Auckland Council were had to determine how we could best partner to undertake this work. We are also working with Kiwi Coast, DOC, and Queen Elizabeth II National Trust to ensure bittern are monitored in a consistent manner across the region during the 2023/24 spring and summer field season.

Bittern are monitored using acoustic recording devices, known as AR4s, which are left in the field for an extended period of time to record the distinctive boom that male bittern make during the breeding season (late spring to early summer). The audio files are then manually analysed by listening and visual searches on computer software.



Australasian bittern (photo credit: Imogen Warren Photography).



Example of an Australasian bittern boom, visible on Freebird software used for analysing audio recordings on AR4 devices.



## Wetland fish surveys

Two fish surveys were conducted at Ngāti Hine's Taikirau Farm at Maromaku. Ngāti Hine are undertaking a large-scale restoration project on this property and approached NRC to conduct an initial fish survey with the hope of detecting mudfish (*Neochanna* spp.). No mudfish were found during the initial survey or a follow up survey, but eDNA sampling detected shortfin eels (*Anguilla australis*) and longfin eels (*A. dieffenbachii*) and banded kōkopu (*Galaxias fasciatus*). Only one 20cm shortfin eel was caught in a Gee minnow trap.

Biodiversity and Biosecurity staff will work with Ngāti Hine Forestry Trust kaimahi in late 2023 to undertake a BioBlitz whereby species lists for plants, birds, lizards, and other organisms will be produced. This will help inform Ngāti Hine Forestry Trust's restoration efforts going forward.



Part of a degraded wetland area on the Ngāti Hine property that is going to be restored.



Left – area of open water at the northern boundary of the property; right – native toetoe (*Austroderia fulvida*) amongst wetland vegetation on the Ngāti Hine-owned Taikirau Farm.



## c. Ngā Awa | Streams and rivers

Biodiversity staff have been assisting the Compliance team in assessing barriers to fish passage across the region. Many native fish require access up and downstream to complete their lifecycles. Barriers like culverts, weirs, dams, and sometimes bridges, can hinder fish passage by changing water flows, altering natural channels, or present vertical barriers that some poor climbing fish like īnanga (*Galaxias maculatus*) physically cannot get up.

Over 100 barriers have been assessed by our team so far, but Northland has tens of thousands of

fish barriers. Quarterly hui (meetings) with district councils, DOC, Whitebait Connection, Fish and Game, NZTA, KiwiRail, Nga Kaitiaki o Nga Wai Māori, and other key stakeholders, have been attended to ensure collaboration is achieved in drafting the Northland Fish Passage Action Plan. MFE are funding a project led by NIWA to assist NRC with the requirements of the National Policy Statement for Freshwater Management, which is led by the Compliance team. This included technical training in a Fish Passage Masterclass, focusing on successful remediations of fish barriers, which Biodiversity staff attended.



*A weir at Manguika Gorge, Waikato, used as an example during the NIWA Fish Passage Masterclass in May 2023. The vertical face would only allow a few native fish to climb up, but the metal lip at the top of the concrete face would make them slip back down. Upstream is amazing habitat for native fish but sadly very few can reach it.*



*Example of a good double culvert system underneath Otaika Valley Road that would easily allow for fish passage and hasn't undermined the structure of the stream bank or altered water flows.*





Example of a fish barrier near Whananaki. Hanging culverts – a common sight in Northland – present a barrier to fish like inanga and smelt (*Retropinna retropinna*) which cannot climb well. The difference in flow between the two culverts would likely hinder fish passage too, for example, if a climbing species were able to access the left culvert there may not be enough water for the fish to navigate.

Native giant kōkopu (*Galaxias argenteus*) caught during the NIWA Fish Passage Masterclass in Hamilton attended by Biodiversity, and Biosecurity and Compliance staff.

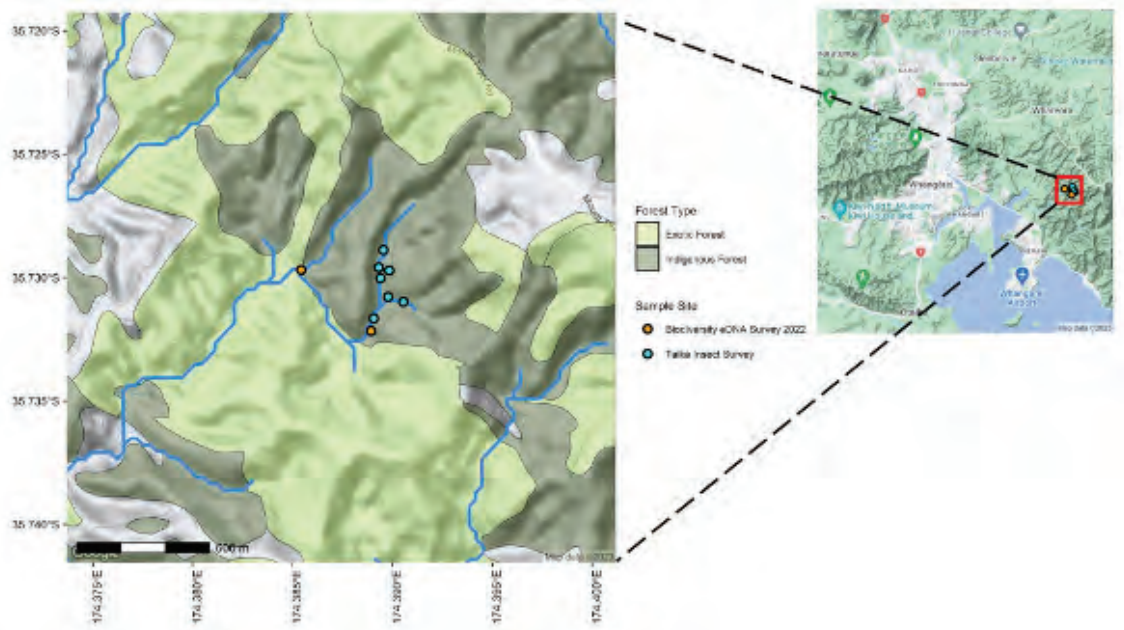


# CASE STUDY

## Invertebrate discoveries in Tāika Forest

During the 2022 Tāika Forest Biodiversity Survey, eDNA survey results detected the possible presence of the Nationally Critical mayfly *Zephlebia* aff. *pirangia* sp. 1. First discovered in Pukenui Forest in 2011, it had not been recorded anywhere else and represented a significant find for the Whangārei rohe (area).

To confirm its presence in Tāika Forest, freshwater taxonomist Steve Pohe was contracted by NRC's Monitoring team to conduct a physical assessment in late December 2022. The survey used a combination of ultraviolet light trapping and benthic hand-net sampling at seven sites on tributaries of the Waimahanga Stream and was the first detailed aquatic invertebrate assessment to be carried out in Te Taitokerau by NRC.



Points show the location of Tāika Forest insect survey sites and eDNA samples taken during NRC's 2022 Biodiversity Survey along tributaries of the Waimahanga stream.

Several specimens collected during the assessment were considered of potential interest but required further investigation (not all life stages can be confidently identified to species level). Tissue samples (insect legs) were sent to Manaaki Whenua Landcare Research's EcoGene laboratory and DNA sequences of the CO1 gene were produced. Sequences were then matched against Pohe Environmental's reference aquatic insect DNA sequence library to confirm their identity.

The results surpassed expectations by confirming the presence of the Nationally Critical mayfly *Zephlebia* aff. *pirangia* sp. 1, identifying 63 discrete aquatic insect taxa, and a total of 11 species of conservation interest, including two species not previously known to science. By default, these two new species would also be threat-listed.





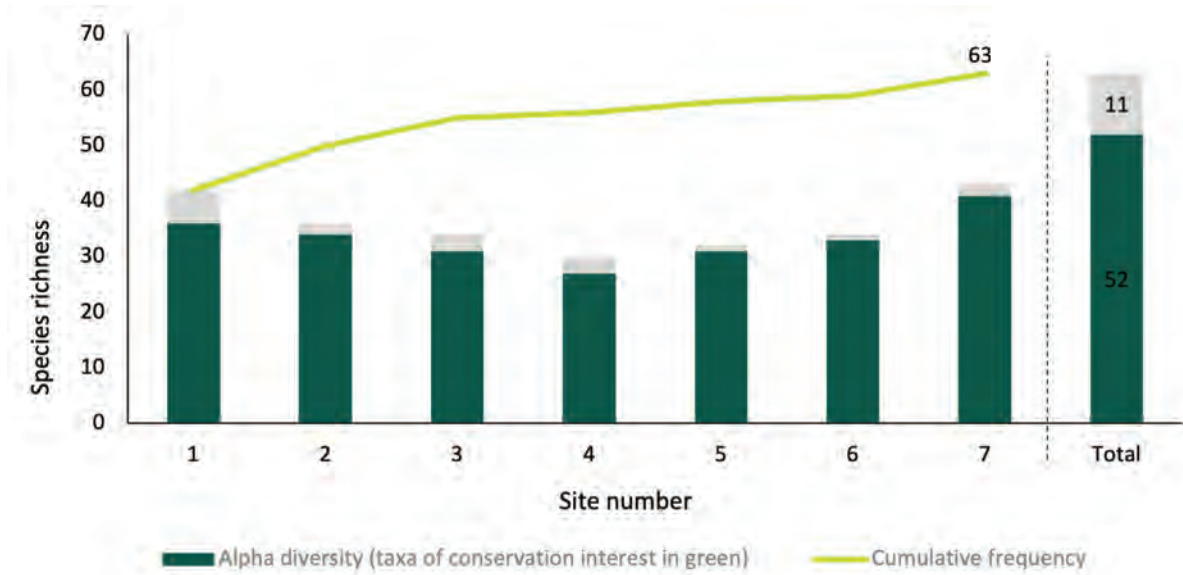
*Zephlebia aff. pirongia sp.1* (photo credit: Steve Pohe and Olly Ball Collection).

Species richness ranged from 30 to 43 taxa across the seven sampling sites, which was significantly greater than the species richness range of two to 12 during previous Macroinvertebrate Condition Index (MCI) surveys in Tāika Forest.

#### Species recorded in the surveys of interest to conservation and freshwater management

| Species   | Insect    | Conservation interest            |
|---|-----------|----------------------------------|
| <i>Zephlebia aff. pirongia sp. 1</i>              | Mayfly    | Threatened, Nationally Critical* |
| <i>Atrachorema mangu</i>                          | Caddisfly | Threatened, Nationally Critical* |
| <i>Tiphobiosis kleinpastei</i>                    | Caddisfly | Threatened, Nationally Critical* |
| <i>Antipodochlora braueri</i>                     | Dragonfly | At Risk*                         |
| <i>Zephlebia tuberculata</i>                      | Mayfly    | At Risk*                         |
| <i>Isothraululus abditus</i>                      | Mayfly    | At Risk*                         |
| <i>Pycnocentria n. sp. F</i>                      | Caddisfly | Data Deficient*                  |
| <i>Zephlebia inconspicua</i>                      | Mayfly    | Not Threatened, Data Poor*       |
| <i>Hydropsyche thomasi</i> *                      | Caddisfly | Not Threatened, Data Poor        |
| <i>Hydrochorema n. sp. (crassicaudatum group)</i> | Caddisfly | New species                      |
| <i>Spaniocerca n. sp. (zelandica group)</i>       | Stonefly  | New species                      |

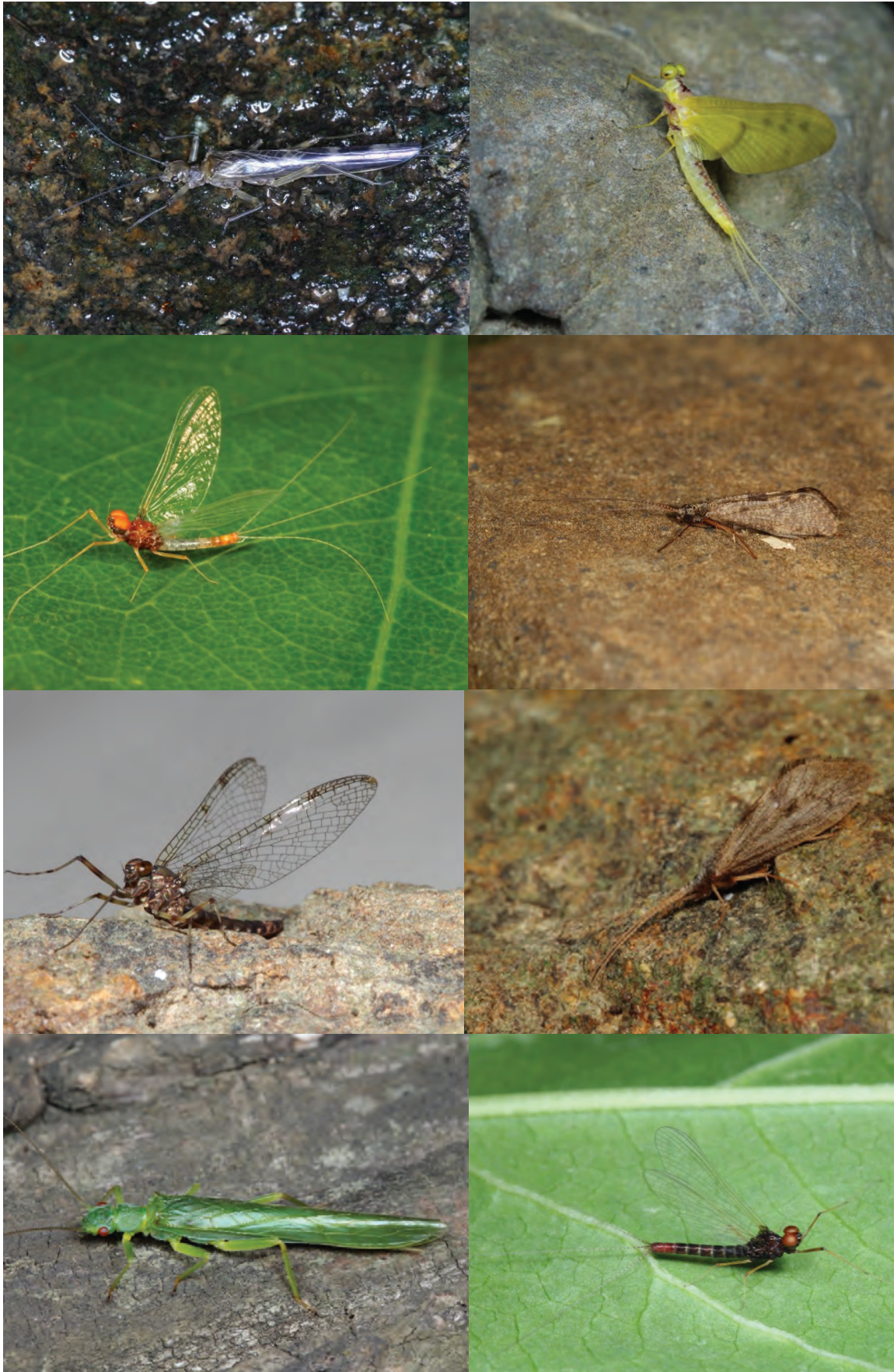
\* See Grainger et al. 2018



Species richness of aquatic insects found in Mt Tiger streams. Bars indicate the number of species recorded at each survey site (alpha diversity), and at all sites combined (gamma diversity). The green portion of the bars indicates the number of species that were of conservation interest. The blue line represents the cumulative frequency of species as new sites are added.

Overall, the results show a diversity of species that you would expect to find in a very healthy forest stream in the Whangārei area. The diversity and high number of species of conservation interest highlighted the value of doing more comprehensive physical surveys, and the general lack of knowledge we have about our aquatic insect fauna in Te Taitokerau. A practical workshop is being planned with Steve Pohe, Ngāti Kahu o Torongāre (mana whenua) and Ngā Kaitiaki o Ngā Wai Māori to share these results and learn about this in-depth process of assessing freshwater invertebrate diversity.





Clockwise from top left: *Acroperla Ameletopsis perscitus* male, subadult *Hydropsyche colonica* male, *Pycnocentroides 1* female, *Deleatidium angustum* male, *Stenoperla prasina Pukenui 1*, *Nesameletus ornatus*, *Mauiulus luma*.



# 6 Te Mata o Te Whenua

## Terrestrial



Flowering pōhutukawa (*Metrosideros excelsa*)



## Terrestrial Environment Fund

The Terrestrial Environment Fund supports landowners to exclude stock and protect the native forests of Northland through fencing grants. Stock exclusion supports the recovery of understory vegetation and enhances the health and resilience of Northland's indigenous forests and associated ecosystem services.

Terrestrial Environment Fund fencing in 2022-2023 delivered:

- 3 projects
- \$20,037 in grants
- 3.1 km fencing
- 104ha of indigenous bush retired from farming.

The Terrestrial Environment Fund was previously distributed by the Biodiversity team but is now distributed by the Land Management team as it aligns more closely with their work with landowners.

## Tāika Forest biodiversity assessment

A comprehensive biodiversity assessment of the NRC-owned Tāika Forest was completed in 2022, and recommendations for future biodiversity management were provided to council. Several recommendations are now being actioned. However, to address pest plant challenges and meet higher biodiversity and partnerships objectives, additional budget has been recommended.

During the 2022-2023 financial year, the following recommendations were implemented:

- Predator control resumed (a 347 bait station network has been revived and has delivered one round of Double Tap pellet bait and cyanide each, pig control has begun, and stoat and cat trapping is ongoing). Two more toxin applications are planned for next financial year, budget pending.
- Biodiversity and Biosecurity team members installed tracking tunnels and completed the pre-treatment round of chew card and tracking tunnel indices (CCI and TTI, respectively). Results indicate high densities of both possums (89% CCI) and rodents (rats: 69%, mice 29% TTI). These have provided baseline measures for ongoing output monitoring of predator control operations and will be paired with outcome monitoring on forest bird populations. Basic outcome monitoring using five-minute bird counts will begin in August 2023.
- A baseline lizard survey plan is complete, and delivery is planned for the upcoming spring/summer (pending approval of a Wildlife Permit from DOC approval and budget confirmation).

- Long-tailed bat survey plan was completed, and delivery is planned for upcoming spring/summer (pending Wildlife Permit and budget confirmation).
- Fish passage remediation and re-assessment is planned pending budget approval, including use as a case study for Te Taitokerau.
- Tāika native orchid survey was completed in spring 2022 with a total of 15 species of native orchids present.
- One stream site has been integrated into the NRC freshwater State of the Environment biodiversity monitoring programme (fish and invertebrates).
- A specialist survey has confirmed the presence of the Nationally Critical mayfly *Zephlebia* aff. *pirongia* sp. 1 and identified seven further invertebrate taxa with a conservation threat status, another two that are considered sparse or data poor, and two species that are new to science (these will also be threat listed by default). See case study for further information on (Page 62).

This work is being delivered across the Biodiversity, Biosecurity, Predator Free 2050, Science, Monitoring, Compliance, and Property and Investments teams, with input from Ngāti Kahu o Torongāre and Kiwi Coast.



*Biodiversity staff recording native orchid species in Tāika Forest.*



*Healthy ground cover of Nertera dichondrifolia in Tāika Forest.*



## Whakakoro follow up survey

Biodiversity and Biosecurity staff visited Whakakoro, a magnificent block of coastline south of Herekino, which is owned and managed by Te Rarawa Rūnanga. This was a follow up visit from previous survey work with mana whenua in 2020. The day started with a hui (meeting) followed by a site visit.

It is hoped we will return to the whenua (land) in the future with kaitiaki to undertake biodiversity surveys in some of the high value areas that have not yet been visited or reported on. The information from these surveys is helping the owners make decisions around management of the block, pest control, and biodiversity protection.



*NRC staff at Whakakoro.*



*The inland habitat of Whakakoro.*



## Botanical Rambles

The Biodiversity team continued to help deliver social Botanical Rambles, an after-hours opportunity for keen staff and others to explore the diversity of plants in Te Taitokerau and develop botanical literacy in the company of like-minded people. This programme supports the professional development of NRC staff members and knowledge transfer from some of Northland's best botanists.

**During the 2022-2023 year 6 botanical rambles were held:**

- Tane Moana (Tutukākā) – focus on kawaka (*Libocedrus plumosa*) and kauri (*Agathis australis*)
- Pukenui Loop Track – general biodiversity focus
- Parihaka – focus on orchids
- Matapōuri to Whale Bay – focus on coastal forest
- Maungatāpere Maunga – focus on ferns and volcanic wetland forest
- Puketi Nature Trail and Manginangina Kauri Walk – focus on sub-tropical bush and kauri swamp forest



Threatened – Nationally Critical swamp maire (*Syzygium maire*) canopy in the Maungatāpere crater.



Biodiversity staff member and the buttress roots of pukatea, another adaptation for living in wet conditions.



The Botanical Ramble whānau having lunch together in Pukenui Forest.



*Thelymitra longifolia* spotted on a Parihaka orchid ramble.





Far left: Botanical Ramblers in Puketitī Forest.  
Left: Veronica ligustrifolia, a beautiful native hebe found on the east coast of Northland and common along the Matapouri Coastal Track  
Below: Houpara (Pseudopanax lessonii) spotted during the coastal botanical ramble.



Native flower challenge created by botanical ramblers Ian Skipworth.



Indigenous relative of the common blackberry, tātārāmoa/bush lawyer (*Rubus cissoides*).

## Kaurilands Summit

The Biodiversity team led a workshop on kauri forest ecology for the Kaurilands Summit at the A.H. Reed Memorial Park, Whangārei. Around 20 people participated from around Aotearoa, learning and sharing knowledge about native species, kauri forest succession, impacts and structure.



*Regenerating kauri forest at the A.H. Reed Memorial Park.*

## Bat surveys

Biodiversity staff were approached by the Biosecurity team to assist with bat monitoring on a property that borders the Tahere River. The landowner has a long-term relationship with the Biosecurity team and has extensive pest control on their property. Monitoring bats is one way to measure the success of this valuable mahi. Site visits were undertaken in December 2022 to locate good areas for the acoustic recorders which were deployed in early January 2023 for one week. We detected another new record of long-tailed bats (*Chalinolobus tuberculatus*) in the Whangārei region. The recordings did not indicate a roost nearby, just bats passing through, but highlighted the need for further monitoring and continued pest control.

## Bat Hui 23

After recording pekapeka (bats) in the NRC-owned Tāika Forest, two Biodiversity staff and a hapū representative from Ngāti Kahu o Torongāre had the opportunity to attend 'Bat Hui 23' – a conference on bats hosted by DOC in Hamilton. Staff met other organisations and community groups doing mahi for bats around the country and eagerly absorbed the talks delivered by top experts working with bats in New Zealand and Australia.

The conference highlighted the lack of knowledge on New Zealand bats and difficulties associated with their monitoring. Most studies have been conducted on bats in isolated, protected areas of forest in Fiordland and Pureora, with very little knowledge development on Te Taitokerau populations. In addition, there have been very few studies that included bat populations living in fragmented landscapes or near urban areas, such as those we are finding in Whangārei.

## Bat Records

A webpage to capture bat sightings was created with the help of NRC's Community Engagement team and launched in December 2022. Only one sighting was recorded in the 2022-2023 financial year. We believe this highlights the lack of knowledge of the general public around the presence of bats in New Zealand. It is hoped that with repeated exposure of bats on our website, social media platforms, and at events like Field Days, more people will become aware of New Zealand's bats and be able to get involved in their conservation.



# CASE STUDY

## Behold the backyard bat

Northland is home to two species of pekapeka; long-tailed bat (pekapeka-tou-roa) and Northern lesser short-tailed bat (pekapeka-toupoto; *Mystacina tuberculata aupourica*). The long-tailed bat has the highest threat classification of Threatened – Nationally Critical. This means their population is expected to decline by up to 70% in the next three generations. The Northern lesser short-tailed bat is also very rare with only two known populations in Northland remaining, and one on Little Barrier Island. It is Threatened – Nationally Vulnerable which means it is facing a high risk of extinction in the medium term.

A bat survey in Tāika Forest (Mt Tiger, Whangārei) using AR4 acoustic recording devices detected long-tailed bats in an exciting find for Northland. Prior to this, the only other known sites of the native bat in Northland, which despite its 'long-tailed' name only has a body the size of a thumb, was Puketi, Pukenui and Otaika forests with historical records in Glenbervie.

Recording devices were hung at 23 sampling locations in trees and programmed to record an hour before sunset and an hour after sunrise. The survey period occurred during the darker moons either side of Whiro (new moon) of the maramataka Māori (Māori lunar calendar). A total of 764 long-tailed bat passes were detected in Tāika Forest, with the number of passes being higher in native bush compared to areas of exotic *Pinus radiata* forestry. Passes recorded in the plantation forest confirms that forestry areas also provide habitat for the bats, but it is not known whether the pine forests are used for travel, feeding, and/or roosting purposes.

Threats faced by bats in Aotearoa include habitat loss, habitat fragmentation, and predation by ship rats, possums, mustelids, and cats. While the relative impact of each of these predators are unknown, an integrated pest animal control programme will greatly

benefit pekapeka populations in Tāika Forest.

Short-tailed bats are important pollinators of *Dactylanthus taylorii*, which produces native 'wood roses' from where they join to the root of their host plant. *Dactylanthus* is New Zealand's only indigenous fully parasitic flowering plant. They live on the roots of about 30 native hardwood trees, like *Pittosporum tenuifolium* and *Pseudopanax arboreus*. As yet, short-tail bats have not been detected in the Whangārei region. However, there are historical records of *Dactylanthus* from Parihaka and the only current known population is at Puketi Forest where it is parasitic on the roots of tōwai (*Pterophylla sylvicola*).



Retrieving an AR4 acoustic recording device from Parihaka Forest, Whangārei.

## Parihaka BioBlitz

The Biodiversity team contributed to the first Parihaka Bioblitz which involved several field days compiling a plant species list with Ngā Kaitiaki o Ngā Wai Māori, two days with schools and the public, and a preliminary bat survey. In total, 183 vascular plant species were identified, including 11 new species not previously recorded here, and the 'Threatened – Nationally Endangered' native grass, *Microlaena carsei*. Bat recorders were set at four locations along the Hāteā River and long-tailed bats were detected at each site.



Leading the Parihaka Fern Hunt for tamariki at the Parihaka Bioblitz.



Pūri moth (*Aenetus virescens*).



# Puketitī Forest Survey

Staff supported the remeasurement of 40 permanent vegetation monitoring plots in Puketitī Forest as part of a kauri protection and forest health programme. This is a joint venture with mana whenua (Te Rūnanga o Ngāpuhi and Ngāti Kahu Whangaroa Papa Hapū), Ministry for the Environment, Manaaki Whenua Landcare Research, DOC, and the Puketi Forest Trust.



*Incredible mature kauri forest in Puketitī Forest.*



*Puketitī vegetation survey team heading out from the accommodation at Puketi Forest Hut.*

# Threatened species

As part of State of the Environment reporting, Biodiversity staff analysed 1,402 nationally Threatened, At Risk, Non-Resident Native, and Data Deficient indigenous vascular plants and put together a list of Northland species based on the most current (2017) national list<sup>8</sup>.

The Threatened and At Risk freshwater/wetland species are being filtered out as part of freshwater policy requirements around Threatened Freshwater Dependant Species to assist with their conservation and habitat management. The next steps are to expand the list to develop a Regionally Significant Plants list which will cover plants which are rare regionally. This will require input from DOC and external plant experts with regional knowledge. Regional lists assist with identifying, managing, and protecting habitats which are home to rare species and several other regions have published lists.

## Summary of the conservation status of NZ and Northland vascular plants based on the 2017 data. Note that this excludes Non Threatened species in the Extinct, At Risk and Non-resident Native categories

| Conservation Status 2017     | New Zealand (National) | Northland (Region) | Rank                |
|------------------------------|------------------------|--------------------|---------------------|
| Extinct                      | 7                      | 1                  | Extinct             |
| Data Deficient               | 107                    | 14                 | Data Deficient      |
| Nationally Critical          | 213                    | 52                 | Threatened          |
| Nationally Endangered        | 77                     | 14                 | Threatened          |
| Nationally Vulnerable        | 113                    | 41                 | Threatened          |
| At Risk - Declining          | 158                    | 40                 | At Risk             |
| At Risk - Recovering         | 8                      | 1                  | At Risk             |
| At Risk - Relict             | 23                     | 14                 | At Risk             |
| At Risk - Naturally Uncommon | 662                    | 127                | At Risk             |
| Vagrant                      | 14                     | 6                  | Non-resident Native |
| Coloniser                    | 20                     | 9                  | Non-resident Native |
| <b>Total</b>                 | <b>1,402</b>           | <b>319</b>         |                     |

<sup>8</sup> <https://www.doc.govt.nz/documents/science-and-technical/nztcs22entire.pdf>



# CASE STUDY

## Lisa Forester wins national award for native plant conservation

Lisa Forester, Northland Regional Council's Biodiversity Manager, has won the "Individual Involved in Plant Conservation" Award from the New Zealand Plant Conservation Network (NZPCN).

Lisa was presented with her Award at the NZPCN Annual Plant Conservation Awards ceremony held in Queenstown on 06 December 2022.

The awards acknowledge outstanding contributions to native plant conservation so Lisa's success in the Individual category is a hugely well-deserved accolade.

Council Chair Tui Shortland says Lisa's knowledge of Te Taitokerau's plant world is legendary.

"She has been an advocate for wetlands, gum lands, dune lakes, rare and threatened plants for over 40 years and instrumental in the protection of biodiversity in the Northland region."

Lisa is a fabulous mentor and teacher, always taking time to teach others and loves to share her knowledge with agency staff, iwi, and the wider community.

"She has an important influence on the plant world in Northland and shares their respect and passion for Te Ao Māori, incorporating it into her everyday life."

Chair Shortland says as Biodiversity Manager Lisa is well placed to lead and influence a team to achieve sustainable outcomes in CoastCare, biodiversity, and water quality.

"Lisa has made a large contribution of 1900 specimens to the Auckland Herbarium collection and has played a part in discovering many unusual plants in Te Taitokerau. She has also written and contributed to many articles and papers on plants and forest health."

With a fondness for Northland's dunes lakes, Lisa has helped improve the public appreciation and understanding of these incredibly special places. Her advice on their restoration, delineation, and biosecurity continues to be crucial in their protection.



Lisa Forester receiving the prestigious national award for native plant conservation.



Biodiversity Manager Lisa Forester with an original painting of an extinct mistletoe, *Trilepidia adamsii*, last collected in the 1950s. She gets to keep the picture for a "couple of years" as part of her prize.

