Biodiversity Team

Te Tira Rerenga Rauropi

Annual Report 2021-2022

Northland Regional Council
Te Kaunihera ā rohe o Te Taitokerau

Foreword

Nau mai, haere mai

Welcome to our first annual report on biodiversity which covers the period July 2021 to June 2022. Biodiversity is the variety of living things, from genes to species to ecosystems. With our warm, mild climate, Te Tai Tokerau (Northland) has a higher biodiversity than most other regions of Aotearoa. We feel proud that within the Northland Regional Council (NRC), our communities, iwi, hapū, and other agencies, there are so many people passionate about looking after our unique biodiversity. Many teams in NRC work with communities to deliver biodiversity actions. Council's work also includes the development of policy and plans, environmental monitoring, advice, and pest control. This report focuses specifically on the work delivered by the Biodiversity team – a small team with big passion.

In this report you will read about the progress the team has made over the past financial year around management of lakes, protection and monitoring of wetlands, working with coastal communities to restore dunes, environmental education, advice to landowners, communities, and other agencies, as well as the technical support our experts provide across council. Although COVID-19 presented challenges and postponements, we are proud to say that we delivered a full program of work.

On the coast we helped community groups put 12,000 native plants in the ground to restore dunes at 14 sites. We were also privileged to have supported a hapū-led Kaitiaki Ranger programme on the Karikari Peninsula. At 12 sites we monitored dunes with hapū kaitiaki to understand these coastal environments and support good management decisions.

Five years since the start of our Freshwater Improvement Fund (FIF) Dune Lake project, jointly funded by the Ministry for the Environment (MfE), we have delivered most of the project objectives which resulted in improvements for over 30 lakes. Within this project we have undertaken several major pest control programmes, including for three lakes where we no longer detect the target pests. Our strengthening partnerships with Māori resulted in several collaborative projects and numerous dune lake education events for kura. Our Ngā Roto Tapokapoka (dune lake) Tūhono Wānanga was attended by 50 participants from eight iwi and hapū.

The Government's Essential Freshwater Package 2020 included new policy, rules, and guidance around wetland protection, which gives a more strategic focus as we get ready to deliver more for wetlands by way of policy, accurate mapping, increased monitoring, and action on the ground. 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.

One of this year's highlights was a biodiversity survey for Mt Tiger Forest (Tāika Maunga), a plantation forest on the town boundary owned by NRC. Experts from the Biodiversity and other teams worked with hapū representatives to survey bats, plants, lizards, fish, and birds, as well as high value streams and magnificent stands of native kauri forest in several large bush remnants. We look forward to seeing the actions recommended in our Tāika Biodiversity Plan put in place and watching the biodiversity of this property improve with the recommended pest control.

Our goal 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

Ruben Wylie
Po Tiaki Taiao- GM Environmental Services

Geoff Crawford
Chair Biosecurity and Biodiversity Working Party

Contents

Male Clematis cunninghamii flower.

1 Timatanga kōrero
Introduction

Flocks of coastal birds at Pārengarenga Harbour

Background

Northland has a particularly rich diversity of plants and animals with many unique and distinctive ecosystems found nowhere else.

Northland's subtropical climate, coastal influence, diverse soils and landforms, and long geological periods of isolation from the rest of New Zealand have resulted in a rich biodiversity and distinctive ecosystems. Northland holds a notably high proportion of the country's uncommon species and is recognised as a biological treasure chest.

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

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 impressive array of islands and estuaries, and a complex, indented, semi-sheltered east coast. This includes a diversity of coastal habitats, estuaries and dunes on the open coast. A large proportion of the original dune land has been converted to forestry and pasture. Remaining natural dunes are under threat from pests and weeds and from direct human impacts such as inappropriate vehicle use.

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 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. Policy Statements for Coastal and Freshwater Management influence current and future programmes. The National Policy Statement for Indigenous Biodiversity will be a key driver of council directions for biodiversity once it is enacted. All these policy statements recognise Te Mana o te Taiao and increased opportunities for developing partnerships with Māori.

Key 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).

A work plan is developed annually by the 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 relationships with all Northlanders to encourage people to look after our biodiversity, sustain the environment and deliver essential and provisioning benefits to the community. 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

Katrina Hansen
Biodiversity Advisor
Native birds and wildlife, wetland programme co-ordinator, freshwater ecology, wetland monitoring, fish and bird monitoring, oiled wildlife response, data management. NRC programme auditor

Laura Shaft
CoastCare Coordinator
CoastCare, dune restoration, coastal monitoring, community engagement, oiled wildlife response

Stella Kake-Schmid
Kaitiaki Takutai, CoastCare Advisor
Kaitiakitanga, mātauranga takutai, community engagement

Claire Heyns
Biodiversity Advisor (fixed term)
Native fish, pest fish control, Check Clean Dry Advocate, assists with CoastCare and wetland monitoring

Jacki Byrd
Freshwater Specialist (Team Deputy)
Lake management, aquatic pest weed control, land management, FIF (Freshwater Improvement Fund) Dune Lakes Project Manager

Brooke Hartigan
Biodiversity Advisor
Native birds and fish, pest fish, lake management, wetland monitoring, biodiversity education, data management

Stephanie Tong (Steph)
Biodiversity Advisor
Botany, bird monitoring, terrestrial ecology, terrestrial and wetland monitoring, community engagement

Loren Carr
Biodiversity Advisor (fixed term)
Bat monitoring, lakes management, coastal monitoring, general biodiversity, data management, biodiversity education

Solomon Moore (Sol)
Biodiversity Contractor
Assists with CoastCare, Check Clean Dry, biodiversity education, and general work

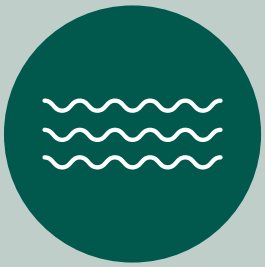
Left to right. Most of the team. Back row – Claire, Steph, Brooke, Lisa, Loren. Front row – Laura, Sol, Jacki

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



Coastal

- Support of Coast Care Groups
- Dune restoration and plantings
- Dune monitoring
- Communications, education and awareness
- Supporting Kaitiaki Ranger programmes
- Oiled wildlife response

Terrestrial

- Terrestrial monitoring and surveys
- Terrestrial eFund management
- Assist community led BioBlitz and biodiversity surveys
- Communications - terrestrial education and awareness

2 Whakarāpopoto ā pūtea
Financial Summary

Navigating through a wetland.

- **Lakes Management (Ecological Monitoring Project):** $107,255 due to COVID-19 cancellations, lakes ecological monitoring contracts were carried forward and delivered in September 2022
- **Wetland Management:** $27,711 budget was significantly underspent due to COVID-19 cancellations
- **CoastCare:** $46,504
- **CoastCare Environment Fund:** $40,000 (budget sat with Land Management)
- **Terrestrial Environment Fund:** $50,000 (budget sat with Land Management)

External funding was received from the Ministry for the Environment for protection of dune lakes in a 50% co-funded agreement with NRC (see page 18 for further details on this project):

- **Ministry for the Environment contribution:** $133.894.86
- **Northland Regional Council contribution:** $133,894.86
- **FIF (Freshwater Improvement Fund) Dune Lakes Project 2021-2022 budget total:** $267,789.72

Delays with recruitment and partnership agreements due to COVID-19 resulted in a favourable variance of $25,170 (1.9% of expenditure) as at the end of June 2022.

Biodiversity Activities 2021- 2022	Budget (revised)	Actual	Variance
Expenditure	$1,607,939	$1,327,036	$280,903
Revenue	$360,416	$104,683	-$255,733
Operational deficit/surplus	-$1,247,523	-$1,222,353	$25,170

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
Number of plants provided through the CoastCare programme	**Target plant numbers:** 2021 / 22: 14,000 2022 / 23: 15,000 2023 / 24: 16,000 2030 / 31: 20,000 Plant numbers are recorded in a spreadsheet broken down to species and site for each planting season. 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).	**12,290 planted** – Target not achieved COVID-19 restrictions in July and August 2021 meant several planting events could not go ahead. Planting was lower than usual in autumn 2022 due to reduced availability of pest contractors, weather restricting pest control and planting. Also, the ability of schools to attend planting days reduced with staff sickness.
Number of top-ranked lakes identified in the Northland Lakes Strategy that are under active management[1] with stock excluded	**Target number of lakes: 20** The lakes are listed and ranked in the Northland Lakes Strategy. Twelve ecologically Outstanding lakes currently have Management Plans. Monitoring records and recommendations for "active management" are recorded as part of annual lakes ecological monitoring reports undertaken by NIWA.	**19 lakes achieved** – Target not achieved Due to COVID-19 restrictions, one of the 20 lakes could not have its Lake Submerged Plant Index monitoring in the time period and therefore did not meet the criteria of active management. Monitoring of this lake was rescehduled for 2022/23.

Currently, our largest externally funded project, the Freshwater Improvement Fund (FIF) Dune Lakes project, which runs until March 2023, lists different objectives for each workstream. The table below gives a brief outline of the expected outcome of this project, as agreed with Ministry for the Environment, our funding partner.

Project	Expected outcome	Details
FIF Dune Lakes project	Progress towards achievement of project objectives in the form of reports and invoices are submitted to the Ministry for the Environment each quarter.	Objectives have been met for the pest fish, grass carp and education workstreams. We are working towards completion of other project objectives by March 2023.

[1] 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

Bicultural Collaboration

NRC is committed to working with Māori and this has been recognised as one of four key areas of focus. Our team is proud of our ability to work in partnership with our communities, particularly with Māori. We work in many ways to develop more meaningful relationships with Māori and support their capacity to participate in decision making and exercise kaitiakitanga. Building knowledge together is an important component of this.

The following targets demonstrate our commitment to continuous improvement in collaboration and engagement. These targets were set by our team and align with the Biosecurity Group's targets which were approved by Council and the Tai Tokerau Māori Advisory Committee.

Target	Result	Details
Bicultural collaboration	**Achieved** At least 14 collaborations in 2021/22	At the end of 2021-2022, the Biodiversity team had new and strengthened collaborative relationships established with hapū, whānau or iwi as follows: • Ngāti Kurī, Te Hiku (Te Aupōuri, Ngāi Takoto, Te Rarawa), Te Roroa, Te Uri ō Hau – FIF Dune Lakes Partnership • Ngāti Kurī – lakes and wetland management • Patuharakeke hapū – coastal dune monitoring and management, lakes, and wetlands • Ngāti Kahu o Torongāre, Nga Kaitiaki o Ngā Wai Māori – Maunga Tāika survey • Ngāti Kahu – Kaitiaki Rangers: summer 2021/22 • Te Rarawa – dune restoration and protection at Ahipara, Tauroa Point and Mitimiti; Kaitiaki Ranger program • Ngāti Manu, Ngāti Wai – Russell Forest baseline vegetation and bird survey with Manaaki Whenua Landcare Research
Bicultural capability All permanent staff achieved competency in Level 1 in council's Te Whāriki workshops	**Achieved**	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	**Ongoing**	Most staff in the Biodiversity Team have achieved competency in Te Whāriki Level 2 workshops.

Mina Pomare-Peita, Brooke Hartigan, Lisa Forester and Mane Mathews at Whakakoro during a biodiversity survey.

NIWA, NRC, DOC, and Te Uri o Hau staff at Lake Tutaki, Poutō.

Claire Heyns, Chantez Connor-Kingi and Nicki Wakefield undertake a fish survey at Maunga Tāika.

Events

During the year many events were cancelled or unable to run due to COVID-19 regulations. Events are a vital part of the community engagement work carried out by the Biodiversity team and it has been difficult navigating two years of COVID-related restrictions. Despite this, the Biodiversity team organised, assisted with, or attended:

- **Two noho taiao events organised by Te Aho Tū Roa,**
- **Various working bees and planting days,**
- **CoastCare attended 10 events and planting days at 11 sites.**

Almost 1,000 students from 97 schools attended one of 14 'Get to know your dune lake' days at lakes across Northland between May 2019 and June 2022 under the FIF Dune Lakes project. These events are a collaboration with Enviroschools, Te Aho Tu Roa, iwi/hapū and Department of Conservation.

The team looks forward to a reinvigorated events season in 2022-2023.

Weeding and planting day with Ngunguru School at Matapōuri.

Social Media and Media Engagement

We aim to promote the plight of Northland's biodiversity and how important it is look after our natural world. We also want to let the community know what the NRC is achieving and how we can support their efforts. The target below describes how we are doing with our external engagement.

The Biodiversity team connects with the community via the council's Facebook, Instagram, website and regular media releases. No Biodiversity-related Instagram posts were made during the 2021-2022 financial year. Seven Facebook posts were made, six of which related to Check, Clean, Dry and preventing the spread of aquatic pests, and one post about dune monitoring and katipō spiders *(Latrodectus katipo).*

Our goal for 2022-2023 is 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.

Target	Result	Details
Community Engagement – social media – Total number of social media interactions maintained or is greater than the previous year.	**Ongoing**	Most social media posts relate to Check, Clean, Dry and preventing the spread of invasive aquatic weeds, largely due to the significant effort taken in our FIF Dune Lakes project to eradicate aquatic weeds from a number of lakes. There were also social media posts about CoastCare and beach/dune protection.

Two bi-annual CoastCare eNewsletters were distributed:

- 11/01/2022 - CoastCare Northland | Issue 29
- 15/07/2022 - CoastCare Northland | Issue 30

The Biodiversity team also contributed to the Land Management team's Hills to Harbour Newsletter.
Three media releases were made during the 2021-2022 financial year by NRC, plus one feature article in the Northern Advocate and another in the Bream Bay News:

Date	Post	Source
15 July 2021	Landowners urged to reverse poor wetlands record	Northern Advocate
9 March 2022	Rare katipō a focus of new dune monitoring study	NRC media release
10 March 2022	What's growing in the dunes?	Bream Bay News
2 May 2022	Duck shooters, eel fishers asked to help stop weed spread	NRC media release
22 June 2022	Kaitiaki rangers help protect beaches through kōrero	NRC media release

Wetland media posts

In July 2021, the Northern Advocate ran a feature article on wetlands highlighting their values, rarity and protection. NRC's August Land Management e-newsletter, From Hill to Harbour, featured several wetland articles: 'Why are wetlands important'; 'Wetlands and climate change'; and 'Rules around wetlands' which the Biodiversity team contributed to.

Community Partnerships

In addition to business-as-usual work, we continue to raise community awareness and understanding of biodiversity values and the threats posed to Northland's biodiversity, and to encourage and remove barriers to community action, though advice and support. We support 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.

Partnership activity		**Details**	
Council-supported programmes	**Environment Fund**	**2020-21**	**2021-22**
Environment Funds approved for the community	CoastCare projects	$38,766	$20,522
	Terrestrial Environment Fund fencing projects	29,492 4.6 km fencing	$47,458 7 projects, 8.2 kms 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

For wetlands, the Land Management team approved $38,628 in fencing grants to landowners to install 7.16 km of fencing around five 'Top Wetlands' ranked from the best 153 wetlands in the region. Another 6.82 km of wetland fencing was approved for several other sites.

Requests and advice

The Biodiversity team logged 48 requests for information, advice, or assistance this financial year which represents a small number of the total requests dealt with by the team (see Opportunity box). Most of these (32) were regarding the coastal environment and CoastCare, 11 related to wetlands, three were terrestrial related, and two around lakes. Queries ranged from requesting information on beach surveys to a new landowner requesting advice on maintaining a top wetland. However, many of the team's requests for advice or information are not logged in NRC's integrated data management system (IRIS) as this has not been a performance measure for our team in the past.

The Biodiversity team also provides a plant identification service to the public and other teams, especially Biosecurity. We receive identification requests on a weekly basis usually numbering several per month.

Opportunity

The Biodiversity team receive hundreds of requests for advice and information, which take up a significant amount of time, but does not record these as a performance measure, either in IRIS or another NRC system. The team intends to better capture this effort in the 2022-2023 year and will incorporate this as a performance measure.

Team training

It is important that team members are both capable and qualified to undertake work programmes. First Aid qualifications, water safety, snorkelling 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, wetland delineation and electric fishing help with specific project work.

Individual team members completed 26 relevant training courses averaging around 10 trainings each, which contributed to individual career development and ability to undertake their varied roles. Some of this training included:

- Field-based training: wader, snorkel, kayak, 4WD, first aid, emergency O2 provider and resuscitation, electric fishing, NRC boat skipper, recreational bathing monitoring
- NIWA wetland plant identification course, wetland delineation on ground for mapping and regulatory purposes
- Management: team, project, health and safety, and communication
- Civil Defence Emergency Management
- National Oiled Wildlife Response
- Admin: procurement, privacy, retirement planning, project management
- Personal improvement/growth: resilience, mental health, stress management, time management/ procrastination
- Te Whāriki Level 1 and 2 (in house), Te Tiriti online

4WD training skills come in handy at Mt Camel July 2021.

4 Wai Māori Freshwater

Waitahora Lagoon (near Spirits Bay)

a. Ngā Roto | Lakes

Freshwater Improvement Fund Dune Lakes Project 2021/2022

The Freshwater Improvement Fund Dune Lakes Project is a five year project undertaking lake restoration via a number of workstreams which include: Māori partnerships, dune lake education, pest fish removal, herbicide application for aquatic weed control, grass carp removal, and sediment and nutrient control. The project is ending in March 2023.

50
wānanga participants

3
dune lake education events

1,730
plants at Waiparera

1
aquatic weed incursion investigated

3
hornwort lakes treated

2
weed surveillance lakes

11
grass carp removed

490m
fencing upgrade

1
sediment mitigation feasibility study

Māori partnerships

A long-awaited Ngā Roto Tapokapoka Tūhono Wānanga was held in May 2022. This is a major milestone for the project, and the outcomes were successful. Tangata whenua from eight iwi/hapū and NRC staff gathered at Lake Waikare (of the Kai Iwi Lakes) for a three-day wānanga hosted by Te Roroa. Fifty people attended. See the case study on page 20 for more details.

Partnerships and iwi aspirations were discussed and practical skills were shared. Hapū were asked how NRC could contribute to their mahi and the resounding theme was "tino rangatiratanga", ultimately for iwi to plan, decide and deliver with support from agencies. Other requests were for more wānanga, training opportunities, and working towards true partnership.

All participants felt the wānanga was an excellent starting point and looked forward to what could be achieved in the future. The outcomes from the wānanga will form the basis of our planning for partnerships to improve dune lake health, as well as guiding how NRC engages with mana whenua.

A second wānanga is planned for February 2023 as requested by our iwi partners.

Top: Te Atawhai Kumar (Te Aho Tu Roa) and Stephanie Tong (NRC). Middle: a great turnout at the wānanga. Bottom: participants of the Ngā Roto Tapokapoka Tūhono Wānanga.

CASE STUDY

Ngā Roto Tapokapoka (dune lakes) Tūhono Wānanga

Lake Waikare, Kai Iwi Lakes, May 2022 – hosted by Te Roroa
Poutō lakes visit – hosted by Te Uri o Hau

The people: 50 participants from Te Roroa, Te Uri o Hau, Ngāti Kurī, Te Aupōuri, Te Rarawa, Ngāi Takoto, Patuharakeke, Ngāti Wai, Te Aho Tū Roa, Far North REAP (Rural Education Activities Programmes), Northland Regional Council, Mountains to Sea Trust, and Aotearoa Lakes.

The kaupapa: Progressing partnerships for ngā roto tapokapoka (dune lakes).

The happenings: Pōwhiri, whakawhanaungatanga, sharing of mātauranga Māori between hapū & iwi, guest speakers and experiential sessions, including tau kōura (traditional fishing method for harvesting lake kōura), kākahi or torewai (freshwater mussels), kuta harvest *(Eleocharis sphacelata)*, water quality monitoring, submerged lake plant identification, night snorkelling session.

Facilitated wānanga sessions: Aroha mō ngā roto (what we love about our lakes), the pressures lakes face, mahi already happening, development of "pou whare", where iwi/hapū want to go in terms of dune lake management, and how can NRC tautoko iwi/hapū to achieve aspirations for dune lakes.

Ngā hua (the fruits): Whanaungatanga between iwi, hapū and NRC. Clear direction from project partners and the beginnings of shaping ngā roto tapokapoka partnerships post FIF Dune lakes project.

Participants at Ngā Roto Tapokapoka Tūhono Wānanga held at Lake Waikare, Kai Iwi Lakes May 2022.


Left: Loren & Jacki (NRC); right: tāngata whenua representatives at the wānanga.


Left: night snorkel with Experiencing Marine Reserves at Waikare; right: Fiona Richards and Colin French (Te Uri o Hau) introduce the group to Rototuna, Poutō.


Left: Ari Carrington (Patuharakeke) addresses the group; right: Fiona Kemp (Te Uri o Hau) and Snow Tane (Te Roroa) at Waikare, Kai Iwi Lakes.

Herbicide: hornwort control in Lakes Tutaki, Egg and Mt Camel North

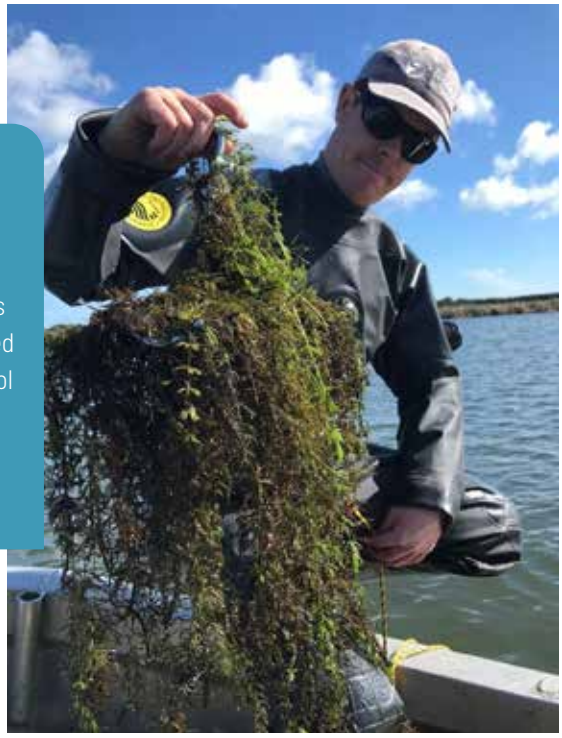
In August and November 2021, Reglone® (Diquat) was applied to three lakes to achieve bulk reduction of hornwort *(Ceratophyllum demersum)* infesting lakes Mt Camel North (Houhora), Egg (Poutō) and Tutaki (Poutō). The advantage of using Reglone® was that in Lake Tutaki there was also a small amount of the oxygen weed egeria *(Egeria densa)*, another serious pest only susceptible to Reglone®. See the case study on page 23 for more details.

Water quality monitoring and by-kill surveys were undertaken 48 hours after Reglone® application, with no adverse effects recorded. Shore observations indicated that the herbicide had significantly reduced the hornwort volume in all three lakes. Lake SPI (Submerged Plant Index) monitoring post-herbicide application could not be undertaken due to poor water visibility from an algal bloom in one lake, and then divers were affected by COVID-19 so had to stand down for a month. LakeSPI dives were postponed until the water clarity improved and divers had recovered from COVID.

A second herbicide, Aquathol® K (Endothall), was applied by helicopter to the same three lakes in March 2022.

New hornwort incursions

Hornwort was also found in Lake Karaka on the Poutō Peninsula. Consultation with the owners was undertaken and approval for a control programme was given. Control of hornwort using Aquathol® K is planned for summer 2023, at the same time as follow up control is done at Lakes Tutaki, Egg and Mt Camel North. Enough Aquathol® K was purchased to include Lake Karaka in the control programme.



A rake full of hornwort in Lake Karaka

Lake Karaka with beautiful native marginal vegetation.

CASE STUDY

Aquatic weed control

Lake Ngatu, Sweetwater

In 2020, the invasive aquatic weed lagarosiphon *(Lagarosiphon major)* was controlled in Lake Ngatu. Annual surveys are now undertaken to search for the weed and if none is found by September 2025, we can declare an eradication. No lagarosiphon has been found since the herbicide treatment in 2020.

Healthy populations of Trithuria inconspicua, a critically endangered lake plant, previously in decline here, were found during the annual survey in 2022.

Airboat on Lake Ngatu in 2020, about to apply herbicide for lagarosiphon treatment.

Crew of NRC, NgāiTakoto and airboat operators who were involved with the herbicide project.

Education

A 'Get to know your dune lake' education event was held at Rotokawau on the Poutō Peninsula. A noho taiao event was held at Lake Waiporohita on the Karikari Peninsula and another at Waimimiha near Ahipara. 130 students from more than 14 schools attended these three events. Another two events are planned for Year 6.

Children arriving to a dune lake event at Lake Humuhumu on the Poutō Peninsula.

Brooke, Lisa and Jacki at Lake Kanono setting Gee minnow traps for an education event in 2019.

Pest fish

Pest fish like tench *(Tinca tinca)* and rudd *(Scardinius erythrophthalmus)* are a serious threat to dune lakes. They predate on native species, reduce water quality by adding excess nutrients, disturb sediments, and typically have great breeding success leading to increased competition for resources with native fish species. 107 tench were caught and killed in May 2022 from Lake Kapoai (Te Kōpuru). In addition, 1,526 common bullies *(Gobiomorphus cotidianus)*, 4 longfin tuna *(Anguilla dieffenbachii)*, 1 shortfin tuna *(Anguilla australis)* were caught and returned live to the lake. Tench measured between 50 and 550mm, the mean length of juveniles was 78.24 mm, mean length of adults 402 mm, and mean weight of adults 0.845 kg.

In total 6,261 tench, 873 perch *(Perca fluviatilis)*, 9 goldfish (*Carassius auratus)*, 7 koi carp (*Cyprinus rufrobrofus)*, 3 koi-goldfish hybrids, and 21,643 gambusia (*Gambusia affinis)* have been removed from 6 lakes by the FIF Dune Lakes program. More fishing will be done in 2022-2023.[2]

Juvenile tench from Lake Kapoai.

Large female ornamental rudd caught in Rototuna, Poutō. No rudd have been seen or caught from this lake since this fish was removed in 2019.

[2] For more information on Northland Regional Council's freshwater pest programme please see Chapter 8 of the Annual Report on the Biosecurity Operational Plan 2021-2022.

Grass carp removal

Grass carp *(Ctenopharyngodon idella)* are a large, herbivorous freshwater fish, native to eastern Asia, and have been used in New Zealand since 1966 as an effective method of controlling aquatic weeds. They have been used to eradicate problem weed species in several Northland lakes, thus allowing native plant communities to re-establish. Grass carp cannot breed in lakes and can live more than 20 years. They are notoriously difficult to capture, often leaping over, pushing under, or straight through, nets.

Approximately 850 grass carp were released into Roto-otuauru/Lake Swan on the Poutō Peninsula in 2009 to control two invasive oxygen weeds. Since this time, the fish have denuded the lake of all submerged macrophytes (aquatic plants), including those that are native. Under the FIF Dune Lakes project, NRC has attempted to reduce the total number of grass carp at Roto-otuauru to allow native macrophytes to recolonise and, in time, restore the lake to a more natural state.

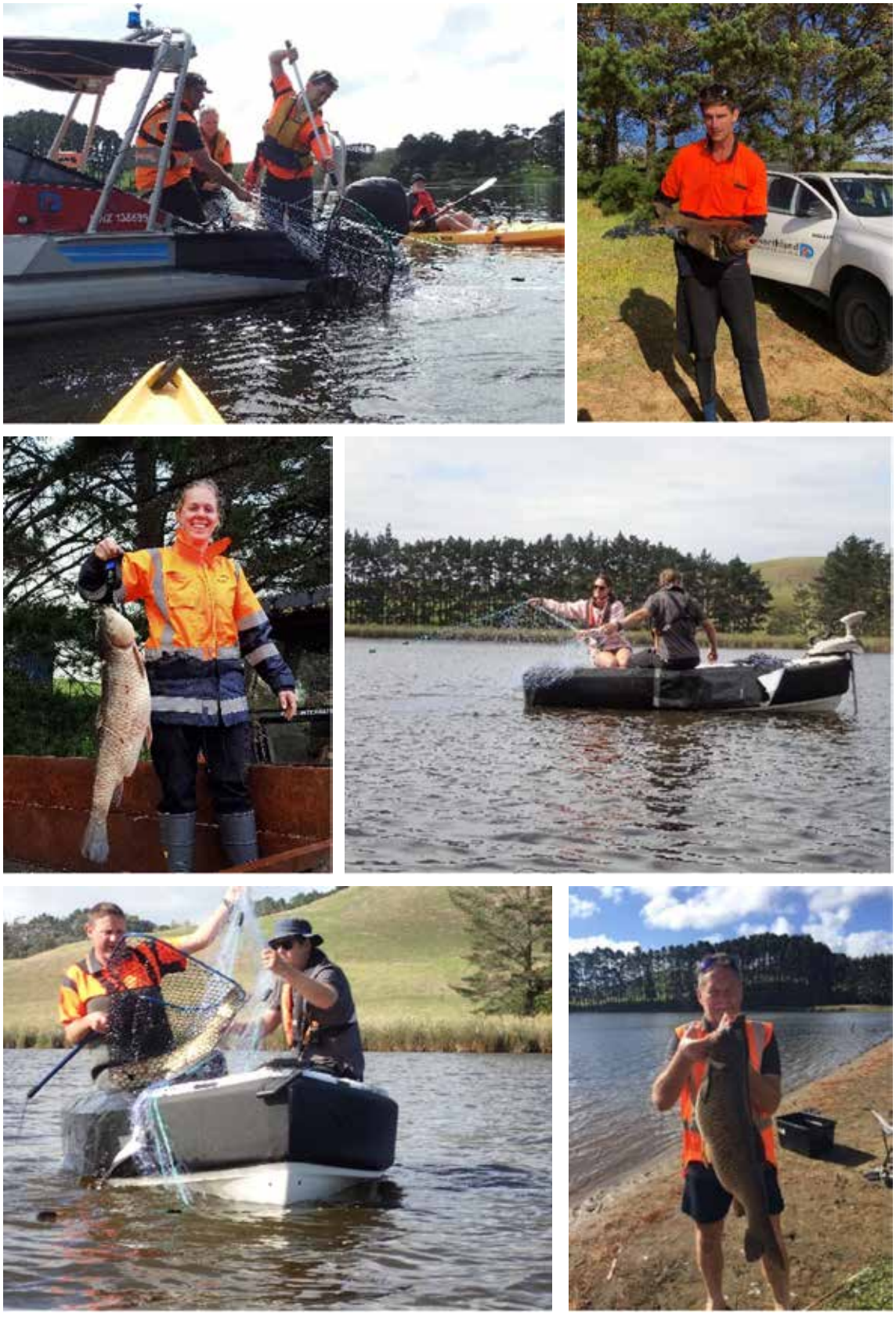
Over three days, eleven grass carp were removed from Roto-otuauru (Lake Swan) on the Poutō Peninsula in May 2022. The mean length was 715mm and the mean weight was 5.15kg. This brings the total number of carp removed from Roto-otuauru in this project to 83 out of the original 800 that were released (10.3%). Despite low catch rates, it is still useful to continue reducing fish numbers to allow native submerged plant beds to re-establish and in turn improve water quality. Every fishing attempt also allows us to refine our methods.

Grass carp from Roto-otuauru.

Retrieving nets from Roto-otuauru.

An automated fish feeder is being developed to habituate grass carp and allow for more targeted fishing. In total, 180 grass carp have been removed by the FIF Dune Lakes programme since October 2020 from three lakes: Roto-otuauru (Swan), Lake Midgley (Omamari) and Lake Heather (Awanui). Grass carp removal will continue in three lakes in Year 6 (2022-2023).

TLI (trophic level index) is monitored quarterly for these grass carp lakes. TLI is calculated using four water quality measurements – total nitrogen, total phosphorus, water clarity, and chlorophyll **α**. Nitrogen and phosphorus are key nutrients that cause plants to grow and drive algal blooms. A low TLI score is an indicator of better water quality. TLI scores are expected to decrease as grass carp are removed from the lakes, with improvements in water quality.



Photos from the various grass carp fishing trips at Roto-otuauru (Lake Swan).

Sediment mitigation

Wetlands act as a natural filter, trapping sediment suspended in water that would otherwise enter our dune lakes and other waterways. A contract was let to investigate the construction of wetlands on Lakeland Station, just north of the Kai Iwi Lakes, the property is predominantly in pasture with a small dune lake. The goal was to increase wetland cover to prevent run-off and sediment from the farm entering the dune lake. A feasibility study was undertaken in 2022-2023 as a first stage of the project to ensure it could be built within the existing budget.

(Update note: The study indicated that construction of wetlands at Lakeland Station was not feasible or within budget. Plans to undertake this work were suspended and the budget transferred to the herbicide workstream).

Fencing and planting

Summit Forestry upgraded 490 m of fence at Lake Gem (southwest of Lake Ngatu) as part of their pōhutukawa restoration project which will connect the two lakes and provide for walking and cycle access to the west coast of Northland.

An old fence was repaired, and a new mountain bike gate installed at Lake Gem by Summit Forestry with support from the FIF Dune Lakes project.

Te Runanga o NgāiTakoto undertook site preparation and provided 1,730 native plants as part of a noho taiao event at Lake Waiparera in June. The plants were funded by the FIF Dune Lakes project.

Planting event organised by Ngāi Takoto at Lake Waiparera and supported by the FIF project.

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 3-5 years on a rotating basis. This program compliments regular NRC 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 involve a team of NIWA, NRC, and 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 including 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.

The 2021/2022 lakes ecological survey was postponed at least three times due to COVID-19. NIWA were unable to provide a full dive team before the year ended so the budget was rolled forward and a reduced survey was undertaken in August 2022 by snorkellers, hydro-acoustic survey, and drop rakes. A wetland shore team undertook plant, bird and fish surveys.

The Northland Lakes Strategy, strategy update and strategy review produced by NIWA recommend ongoing ecological monitoring of 47 lakes and 13 threatened species found at the lakes. LakeSPI results are available on the NIWA and LAWA (Land Air Water Aotearoa) websites.

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[3].

Opportunity

A gap/future opportunity is around delivery of restoration actions in high value lakes. Currently lake restoration actions are largely funded by the FIF Dune Lakes project. Continued restoration actions are part of implementation of Lakes Strategy produced by NIWA and NRC and are an obvious next step when the FIF Dune Lakes project ends.

Botanists botanising during lakes the ecological survey at Lake Karaka whilst waiting for their boat pick up.

[3]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.

[4] Champion & de Winton, Northland Lakes Strategy, 2012; Champion & de Winton, Northland Lakes Strategy Part II: update and implementation strategy, 2014; Champion, Review of Northland Lakes Strategy 2020 and recommendations for the future, 2021

Celebrating 20 years of NRC and NIWA lakes surveys with a group photo at Lake Ngatu.

Katrina bird counting at Lake Ngatu.

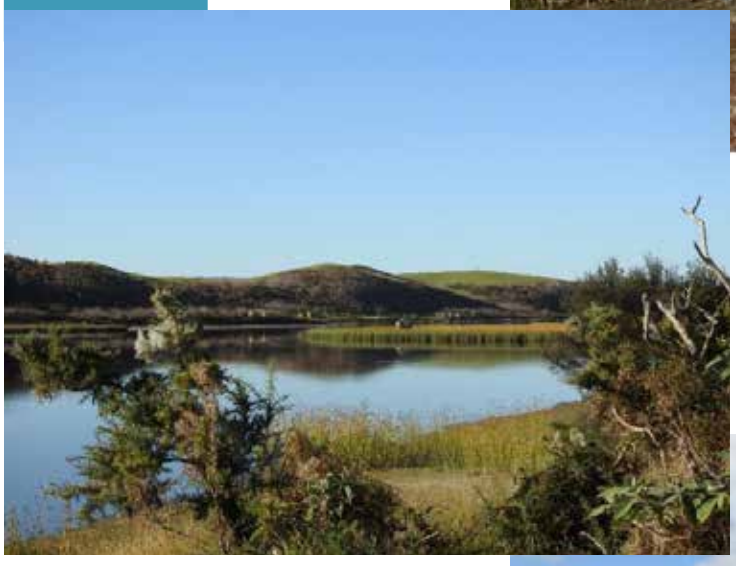
Ngāti Kurī kaumātua Wayne Petera at Waitahora which is a priority water body for Ngāti Kurī iwi.

Discussing alligator weed beetle (Agasicles hygrophila) biocontrol at Lake Waiporohita.

Ngatu

Waiporohita

Rotoroa



Rotopotaka

From top to bottom: Lake Ngatu, Lake Waiporohita, Lake Rotoroa, Lake Rotopotaka

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. Although this is biosecurity surveillance, it is efficient for the Biodiversity team to organise this work as part of our usual lake survey programme. This has resulted in several successful aquatic 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 which aims at preventing the spread of freshwater pests between waterways. This programme compliments the Biodiversity team's pest surveillance and ecological survey work.[5]

Lake Taharoa – Kai Iwi Lakes

Divers searched Lake Taharoa in July 2021 for aquatic weeds. Three areas were searched within depth bands in areas identified as high risk. Divers conducted two depth band surveys per site to cover as much vegetation as possible. Use of underwater scooters maximises diver efficiency by allowing larger areas to be searched within dive time limits. No aquatic weeds were identified at Lake Taharoa.

Rotokawau – Poutō Peninsula

Divers undertook a delimitation survey of the serious pest oxygen weed egeria in Rotokawau and a trial to remove the weed by hand will be done in the summer of 2022.

From left to right: hornwort, egeria, elodea (Elodea canadensis) and lagarosiphon

[5]For more information on Northland Regional Council's freshwater pest programme please see Chapter 8 of the Annual Report on the Biosecurity Operational Plan 2021-2022

CASE STUDY

Dinosaur plant

Trithuria inconspicua

More ancient than a tuatara and as rare as a kākāpō, the tiny plant *Trithuria inconspicua* is only found in the sandy shallows of Northland dune lakes. At a maximum of 55 mm tall, this plant certainly fits the name "inconspicua". Living mostly buried under sediment and algae, you are more likely to feel it beneath your bare feet than see it. Despite its diminutive stature, this remarkable plant with its tiny waterlily-like flowers hiding amongst fans of fine, hair-like leaves, has a big secret.

Once thought to be in the same flowering plant order as grasses, recently it was discovered to be in a more ancient sister group alongside the waterlilies. Furthermore, the latest molecular testing consistently puts Northland's *Trithuria inconspicua* in the oldest flowering plant lineage! This is important because, if true, the very first flowering plants were probably soft bodied aquatic plants and not the woody land plants they were thought to be. As flowering plants evolved over a 100 million years ago during the Lower Cretaceous, our *Trithuria* is a true "living fossil". It is not surprising that school children on our dune lakes education days call it "dinosaur plant"!

Trithuria inconspicua might have been around for millennia, but sadly its future on this planet is not secure. Since 1998, it has become extinct in 7 of the 13 lakes which supported populations. Furthermore, no one has been able to keep it alive in cultivation for very long. Frequently described as "the canary in the coalmine" with regard to dune lakes, *Trithuria* is often one of the first plants to disappear – most likely because of declining water quality, competition with pest plants, and possibly droughts causing low lake levels and exposing the plant for prolonged periods.

Trithuria inconspicua is closely related to *Trithuria brevistyla*, which is also rare and grows in South Island glacial lakes. Additionally, their sister, *Trithuria filamentosa,* is from Tasmania. Populations of *Trithuria inconspicua* are often only female and produce seeds by cloning maternal ovule tissue.

Today, populations of *Trithuria* are found in Lakes Ngatu and Rotoroa near Kaitāia, all three Kai Iwi lakes – Taharoa, Waikare and Kai Iwi – and Rotokawau on the Poutō Peninsula. By 2020, the Lake Ngatu population had declined so much there were fears that it could mean another lake-wide extinction. Lake levels had dropped significantly, exposing the main area of habitat, which had become a popular swimming area. This meant the thick beds of *Trithuria* were all but gone. The good news is that recent rainfall raised the lake level and during the ecological monitoring of spring 2021 we found *Trithuria* on all transects, with young plants recolonising suitable habitat wherever we searched.

Clockwise from top left: Trithuria in situ at Lake Taharoa (Kai Iwi Lakes), Trithuria in flower, Lisa Forester (NRC) and Paul Champion (NIWA) celebrate finding a healthy population of the tiny plant Trithuria at Lake Ngatu, healthy population of Trithuria in the sandy shallows of Lake Waikare (Kai Iwi Lakes).

b. Ngā Repo | Wetlands

Originally, 35% of Northland was wetland totalling 453,251ha. This area has been significantly reduced, mainly by draining and land development, to 14,291 ha – only 3.2% of its original area. This is much lower than the national figure of c. 10%[6]. Much of the remaining wetland area is in the Far North with lowland and coastal wetlands, especially in southern Northland, being the most impacted.

Around 75% of our wetlands are smaller than 10 ha and only three are larger than 500 ha. Many of the remaining wetlands are degraded and drainage, pests, weeds and climate change remain the biggest threats. The current crisis is not just about the loss of area but also about degradation of our unique and irreplaceable wetlands and their biodiversity.

The Biodiversity team coordinates wetland work across the council. Staff undertake monitoring and survey work and give advice to landowners including reports and plans. To meet the requirements of the National Policy Statement for Freshwater Management (NPS-FM) the team is coordinating the development of State of the Environment wetland monitoring for Northland and are assisting with a wetland mapping project. In-house expert advice is also given to the Compliance and Consents teams.

Opportunity

Preventing the further loss of natural wetlands is a government focus which they have addressed through the Essential Freshwater Package 2020, including the NPS-FM. Identification of wetlands is required for policy implementation and there is a current gap around the technical capability of field staff across the council to delineate wetlands using a robust national protocol developed to assist with this. Biodiversity staff are experienced with this method and we plan to address this capability gap by delivering in house training around wetland plant identification and use of the delineation protocol.

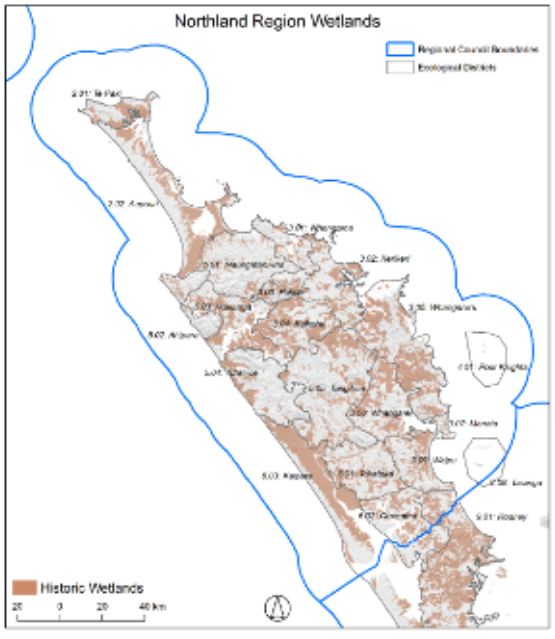


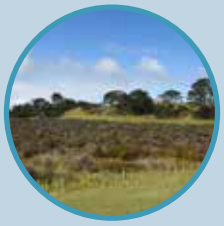
Figure 1. Historic wetlands (c. 1840) of Northland Region Ecological Districts.

Figure 2. Current wetlands of Northland Region Ecological Districts.

[6]Figures for wetland area were taken 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

61
priority sites

32
WCI sites



13
site visits

3
wetland/ biodiversity reports

6
landowners received wetland advice

2
wetland fish surveys

4
compliance incidents

1
TAG established for Kaimaumau Wetland

10
pieces of consent advice

Wetland Condition Index monitoring

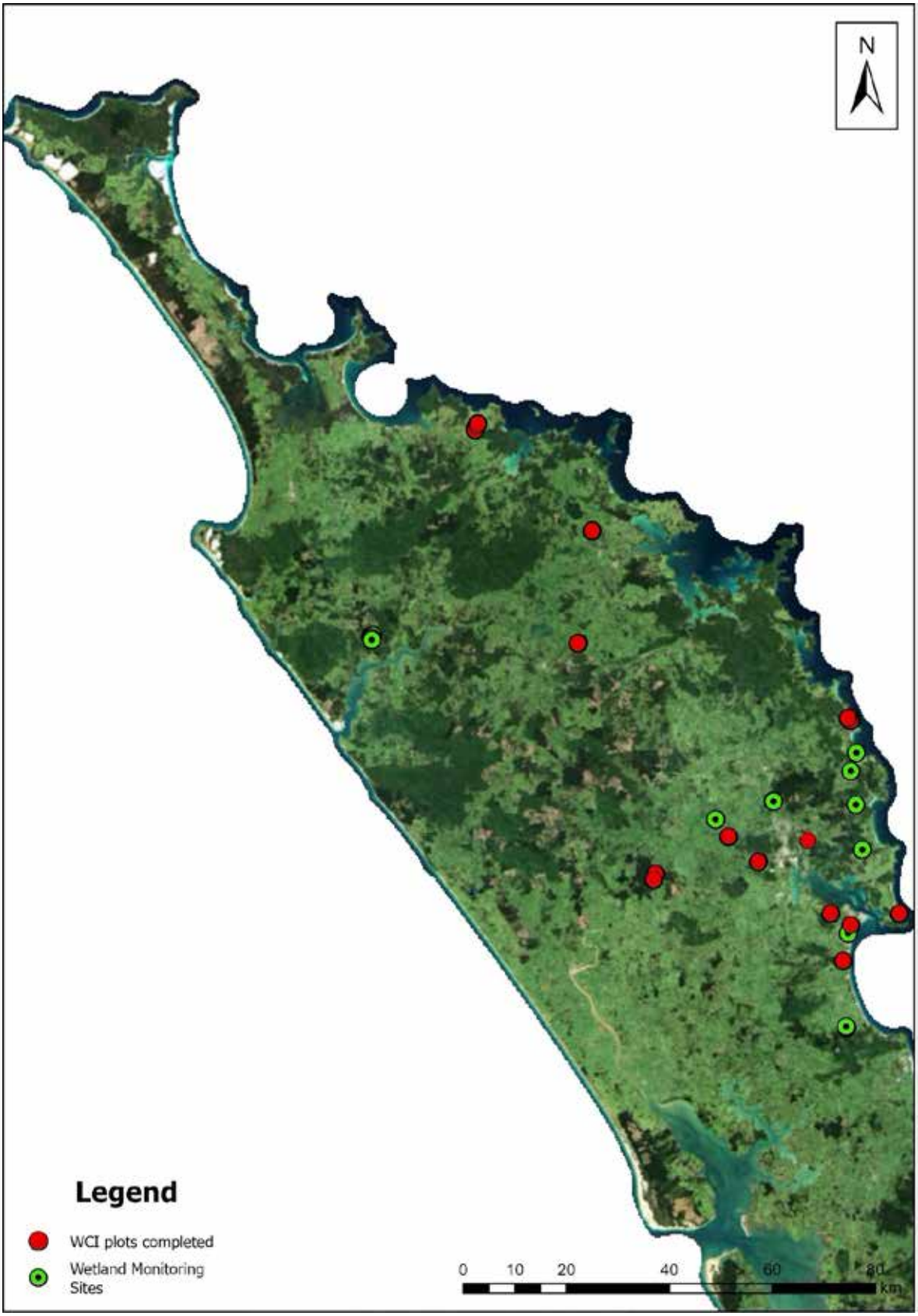
The Biodiversity team monitors the health of wetlands using the national Wetland Condition Index (WCI) system. This monitoring methodology tracks changes in wetland condition over time, based on assessments of hydrology (wetness), soils, ecosystem intactness, and dominance of native biota.

WCI outcome monitoring started in 2011 with 28 wetlands on 18 properties, most of which were fenced with funding support through the Environment Fund. This programme has expanded since 2020 to cover 32 wetlands and includes the main wetland classes with a range of baseline states. Each wetland is monitored every 3 – 5 years. A full range of wetland types (swamps, fens, gumlands etc) are incorporated into our WCI network.

The fourth cycle of monitoring of the original 28 wetlands began during 2021-22 and will be completed in summer 2022-23, with 16 wetlands on 11 properties monitored over 2021-22. Results from the first three monitoring rounds have shown that most degraded wetlands improved their scores and the wetlands in good condition remained stable.

	Original Score (2011)	1st Repeat Score (2015-17)	2nd Repeat Score (2018/19)
Average WCI score	18.04375	19.12144444	19.97270833
Average pressure score	13.25	12.26785714	12.02
Average plot score	13.94897959	15.0625	15.04761905

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 2019. The 2022/23 results are yet to be reported on.



Locations of WCI plots completed (red) between July 2021 and June 2022 with the remaining plots (green) to be completed summer 2022/2023. Many properties have more than one WCI plot.

Developing a SOE (State of the Environment) monitoring programme for wetlands

A robust ground-based wetland monitoring programme for wetlands is needed to meet the requirements of the National Policy Statement for Freshwater Management (NPS-FM). A network design was provided through an Envirolink report completed by Manaaki Whenua – Landcare Research.

The report provides a framework for monitoring the ecological state and trend of freshwater wetlands and provides a set of 61 priority sites, representative of Northland wetlands, from which to develop a 5-yearly rolling monitoring programme[7]. The framework was developed to enable NRC to monitor wetland condition and trend, and to identify any losses in wetland extent or values, to give effect to the requirements under the Essential Freshwater Package 2020 including the National Freshwater Standards (NES-F) and the NPS-FM.

The 61 representative wetlands include all those ranked in the Top 30 (of the 154 top ranked Northland wetlands), all wetlands currently monitored in our WCI programme (including smaller, lower condition wetlands), and additional wetlands monitored by NRC and/or DOC that have unique or uncommon features, poorly represented attributes, or rare and threatened species. The framework allows for setting up an initial monitoring programme using a subset of the 61 priority wetlands, and as capacity permits, building up to a full monitoring programme.

The next steps are to:

- Refine and update information on the wetlands, particularly vegetation type areal extent, using our GIS wetlands database. This will occur over the coming year, in conjunction with updated wetland maps.
- Develop and refine the monitoring methodology for wetlands, including establishing permanent vegetation plots, sampling design including replication and plot size, and overall condition assessment.

[7] 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

Loren and Steph conducting Wetland Condition Index (WCI monitoring).

Wetland mapping

Comprehensive and accurate wetland mapping is required by the NPS-FM and by Council to inform regulatory, monitoring and compliance requirements. Mapping is underway for the Kaipara Moana Remediation Project (KMR) and DOC priority catchments. Council approved long-term funding in 2021/22 and 2022/23 to complete this mapping which will replace the existing, out of date and inaccurate maps. A contract for mapping wetlands, being managed by the Policy and Planning team, commenced in June 2022 and is due for completion in July 2023.

The project involves collaboration with KMR to map Kaipara and Whangarei District catchments in 2022, and Far North District in 2023. The Biodiversity team will have an active role in verification of sites and ground-truthing.

The project is providing:

- Northland terrestrial mapping extent,
- Northland saline influence extent,
- Northland KMR wetland aerial survey photo points.

The outputs will include comprehensive wetland maps.

Example of wetland polygons (blue) overlaid to wetland locations in Photoblique (BioSpatial Ltd: looking east towards Mahurangi River and Kawau Bay).

Landowner – site visits, advice, reports, and plans

Advice and restoration plans were provided throughout the year to many landowners to confirm the presence of wetlands on their property and to support wetland restoration projects. Thirteen site visits were carried out, three wetland and biodiversity reports produced, and wetland restoration advice was provided for many landowners. A further six landowners received advice from Biodiversity staff around the presence and classification of wetlands on their properties, based on desk-top analysis.

Wetland fish surveys

Fish surveys were carried out at two properties. One landowner was extending wetland fencing to exclude stock from part of the eighth highest ranked wetland in Northland, with funding from council's Environment Fund. The fish traps were set within kahikatea swamp forest of the Manganui River wetland complex, and several black mudfish *(Neochanna diversus)* were caught. These fish have a threat status of At Risk – Declining and this survey confirmed their continued presence in this Top Wetland.

The second property was surveyed prior to the planned construction of sediment retention wetlands to improve dune lake water quality, to determine which fish species were present. Native common bullies, which are not threatened, were found.

Black mudfish (Neochanna diversus) in a Gee minnow trap used for conducting fish surveys.

Compliance expert advice

Biodiversity staff have carried out site visits and given advice to Regulatory Services staff for four wetland compliance incidents that resulted in enforcement action, involving drainage, bunding, or earthworks within a wetland.

Biodiversity staff are expert witnesses in one ongoing prosecution relating to earthworks in an estuarine wetland.

Internal advice – Regulatory and Planning

Biodiversity staff provided advice to both the Regulatory and Planning and Policy teams for 10 activities, or proposed consents relating to wetland delineation and wetland impacts.

Left: Jones Wetland near Lake Ngakapua (Awanui); right: Paul Champion (NIWA) and Lisa Forester survey emergent vegetation of a lake.

Kaimaumau Restoration Technical Advisory Group

A major fire burned through over 2400 ha of the Kaimaumau-Motutangi peat wetland in December 2021. This nationally significant wetland complex is the largest remaining and second highest ranked wetland in Northland, containing many endangered species, native birds, mudfish, lizards and plants, and an unnamed orchid found only in the Far North.

Photo: Northern Advocate (21 December 2021)

A multi-agency Governance and Technical Advisory Group was set-up, which involved mana whenua, Department of Conservation, external restoration experts and NRC Biodiversity staff. The group visited the site to consider the issues around weed spread, drains, threatened species management and restoration opportunities, and have advised on the actions required to restore water levels and best manage weeds and threatened species.

Left: Motutangi drain running through the Kaimaumau Wetland with firebreak and weedy Sydney golden wattle regeneration; right: burnt peat and regeneration of native species in a heavily burnt area of mānuka peat bog.

Kaimaumau Technical Advisory Group visit inspect a stand of dense Sydney golden wattle regrowth at Kaimaumau Wetland after the fire.

CASE STUDY

Wetland Condition Index

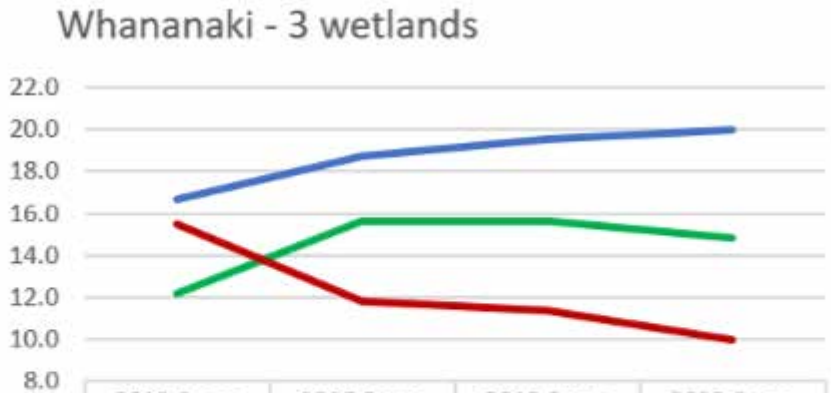
Whananaki – Harman wetlands

Northland has lost nearly 97% of its original wetlands so protecting and enhancing every remaining wetland is important.

Environment Fund grants were awarded to the Harman family to fence around 4,350 m of Te Wairahi and Taupari Streams, including important areas of wetland, and saltmarsh flow into the Whananaki Estuary. This fencing will reduce the amount of sediment, nutrients and bacteria getting into the estuary by excluding stock.

Along with weed and pest control, it will also help protect critical habitat for whitebait that live in and migrate up the streams each year, as well as other species relying on wetlands such as the Nationally Critical matuku-hūrepo (Australasian bittern; *Botaurus poiciloptilus*).

This Whananaki property has now had four cycles of wetland condition index monitoring in each of the three fenced wetlands. The results from these four rounds of monitoring have shown a marked improvement in wetland condition from 2012 to 2016, then steady improvement after that, as shown by increasing wetland (overall condition) and plot scores (native vegetation dominating) and decreasing pressure score (threats like drainage, weeds, stock, predators).



	2012 Score	2016 Score	2019 Score	2022 Score
Average wetland score (/25)	16.7	18.7	19.6	20.0
Average plot score (/20)	12.2	15.7	15.7	14.8
Average pressure score (/30)	15.5	11.8	11.3	10.0

Average wetland, plot and pressure scores of the Harman wetlands since monitoring began in 2012.

CASE STUDY *cont.*

Photos taken of Harman wetland 3 in 2014, then 2016, and 2019

2014

2016

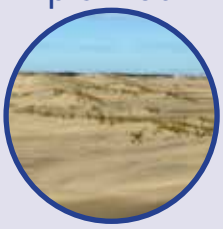
2019

5 Takutai Coastal

32
CoastCare groups

12,290
plants provided and planted

11
CoastCare sites planted



32
enquiries logged

10
events

22
active sites

55
dune transects

6
schools participating

8
marae and hapū participating

Dune restoration works

CoastCare dune restoration work has been undertaken at 33 sites around Northland's coast between 2015 and 2022, with over 81,183 native plants planted. Most of these sites have ongoing restoration work that includes planting, fencing and plant and animal pest control.

Dune restoration work in the 2021-22 financial year was reduced due to COVID-related disruptions. These included a reduced supply of plant nurseries.

CoastCare dune planting at Poutō Point with Poutō School

CoastCare Planting with Russell Landcare Trust and Haratu - Kororareka Marae

Coastal education and advocacy

Seaweek is an annual national week dedicated to getting to know our ocean, it's habitat, characteristics, and inhabitants better. Education and advocacy are an integral part of the CoastCare programme with most of the planting and other work undertaken by volunteers and a large involvement from schools. This work was impacted by COVID-19 in this financial year and no Seaweek CoastCare events were held. A number of school and community working bees and planting events were still able to go ahead.

CoastCare working bee at Matapōuri with Ngunguru School

Planting on Tahi dunes at Pātaua North

Kaitiaki Ranger Programmes

In 2019, a Kaitiaki Ranger programme was developed for Karikari Peninsula, Taipā and Ahipara in collaboration with FNDC, DOC, NRC and local iwi/ hapū.

Over the 2020-21 summer, partial funding was approved Ministry of Business, Innovation and Employment (MBIE) to continue the Far North Kaitiaki Ranger programme with FNDC, DOC and local iwi. Areas covered were Karikari Peninsula, Ahipara, Kaimaumau, Kawakawa and Russell with the operation of the programme varying between areas.

In the 2021- 2022 season the MBIE funding stream was stopped due to COVID travel restrictions. However, a smaller programme was still able to be run for Karikari Peninsula and Taipā with in kind support from DOC and financial contributions from NRC and FNDC.

Kaitiaki rangers at Ahipara

Karikari Kaitiaki Rangers and DOC staff 2019

Dune Health Monitoring

Dune 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.

Since 2015, NRC has been part of the Coastal Restoration Trust's nationwide dune monitoring programme which involves surveying the status of vegetation cover and dune morphology and monitoring the performance of restoration programmes. This began with research and trials into suitable ways to monitor sand dunes with community groups and schools. In 2016 and 2017, transects were set up at several sites and workshops run with community groups and iwi.

Over summer 2021-2022, for the second year, the Natural Resources Science team assisted with dune monitoring. Transects at 12 sites were measured, including three new sites. Tangata whenua and community groups assisted at some of these sites, but this was limited by COVID-19 restrictions.

The surveys followed guidelines developed by the Coastal Restoration Trust. Transects are placed perpendicular to the coast and vegetation cover is recorded at 1m intervals. Data is uploaded to the Coastal Restoration Trust website and can be accessed by volunteers, tangata whenua and the public **https://monitoring.coastalrestorationtrust.org.nz**

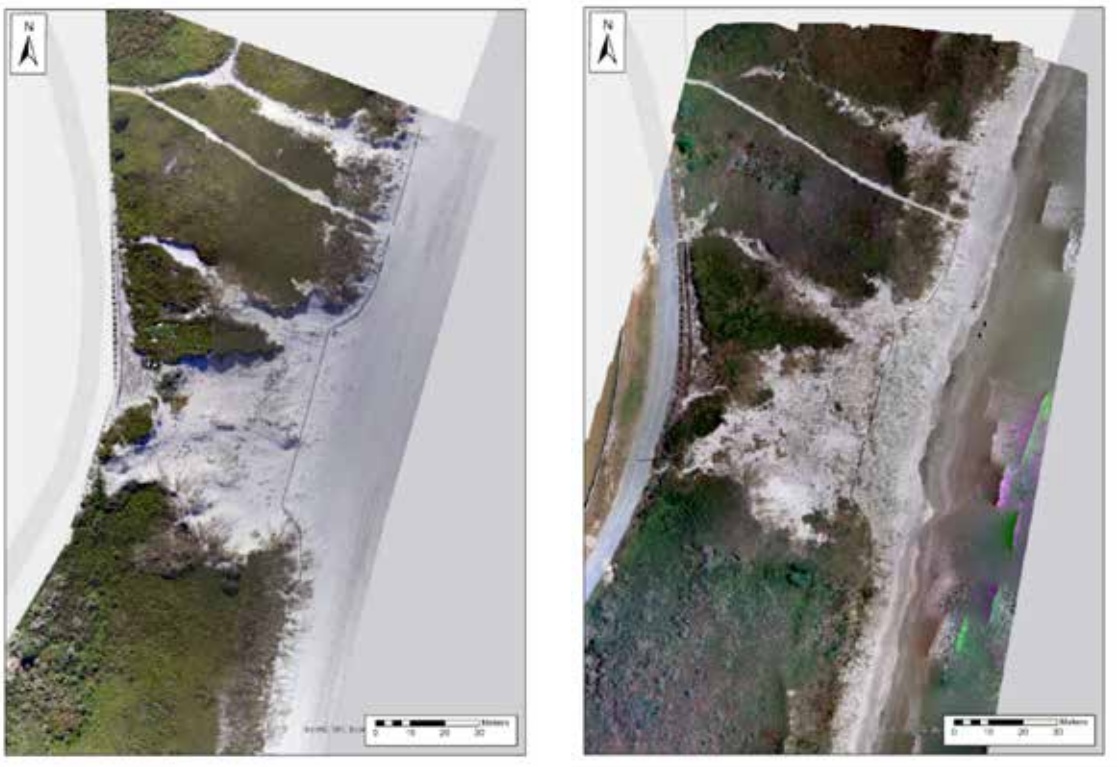
Example of data that can be viewed on the Coastal Restoration Trust website. The pie charts show the species found at one of our transects near Ruakākā Racecourse in May 2017, December 2020 and January 2022.

Renew School students measuring a vegetation transect in Waipū Wildlife Refuge

Drone Surveys

Drone images captured at each monitoring site are processed to create a high-quality, contemporary image of dune systems. This can be useful for assessing vegetation cover and even detecting the presence of pest plants. The images can be used to create a digital elevation model of the dune, which provides information about dune shape and profile. Regular drone flights will complement field monitoring and help track changes in vegetation cover and dune structure over time.

Drone survey at Taipā



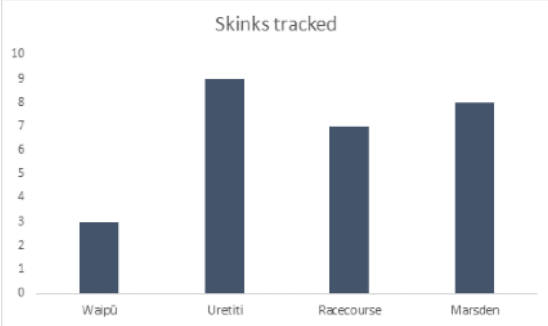
Drone images of Ruakākā Beach in May 2018 compared to December 2021

Fauna monitoring – Bream Bay pilot study

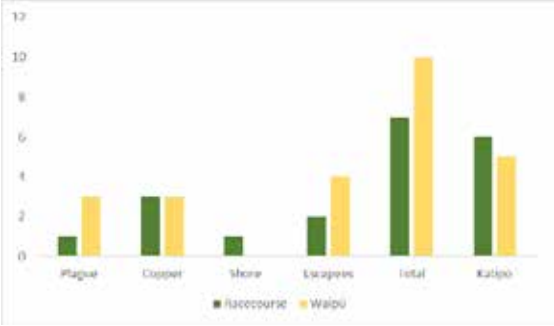
Over the 2020-21 summer, Biodiversity and Natural Resources Science staff collaborated with Patuharakeke Te Iwi Trust Board and NorthTec on a pilot study in Bream Bay to monitor dune fauna. This was run alongside the vegetation monitoring to get a fuller understanding of dune health, and the relationships between plants and fauna in the dunes.

The study assessed the current state of dunes in places where work (such as pest, weed control, and planting) is being undertaken, against 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. A permit was obtained to allow us to catch, handle and release lizards for the purpose of identification.

Various methods for monitoring fauna were incorporated into the study to assess which were most successful. 48 artificial shelters, 40 wax tags and 64 tracking tunnels were installed at four study sites. In addition, four bird surveys and manual searches for katipō *(Lactodectus katipo)* spiders were undertaken.



Skinks detected on tracking tunnel cards at Bream Bay sites



Skinks found in shelters placed in the dunes at Ruakākā and Waipū

Katipō spider, with egg sacs, found in a shelter on Ruakākā dunes.

Shore skink (Oligosoma smithi) found in shelter in Ruakākā dunes.

As well as continuing monitoring at Bream Bay, we plan to use learnings from this study to incorporate fauna surveys into our dune monitoring programme at other Northland sites to get a fuller understanding of dune health and how our restoration work can be tailored for the ecology and challenges of each individual dune system.

CASE STUDY

Ruakākā weed control project

A CoastCare volunteer with wattle growing in the foredunes at Ruakākā at the start of the project.

Volunteers, staff and consultants inspecting the Wildlife Refuge after the fire.

Pest plants are a big problem as dunes are very sensitive to weed invasion and when non-native species take over, this impacts on natural dune functions and their ecology. One such dune system is north of the Ruakākā Estuary, which includes part of Ruakākā Wildlife Refuge. The dunes had become overgrown by more than 35 pest plant species, including coastal wattle *(Acacia sophorae).* Despite massive effort from the local CoastCare group and other volunteers, they were not able to keep up with the scale of the issue and the continual invasion and spread from conservation land to the south.

On-site meetings were organised with representatives from local groups, DOC, WDC staff and contractors, and NRC CoastCare and Biosecurity staff. Following meetings, a report was commissioned which divided the 22 ha dune area into management blocks. These were prioritised and clear, best practice control advice given. The report also recommended a buffer be maintained between the project area and adjacent reserve.

Just as the report began, a fire burnt a large part of the dune area. After the fire, concerns were that without management, weeds would invade faster than native plants could re-establish. Seed dormancy in fire-cycling gorse *(Ulex europaeus),* coastal wattle and banksia *(Banksia integrifolia)* can last more than ten years, but fire can rapidly result in germination of up to 90% of the seedbank. There were also plants such as pampas (*Cortaderia jubata* and *C. selloana*) ready to resprout. This meant the burnt area moved to the top of the priority list. Systematic weed control, as well as planting of natives, meant that the area made a good recovery.

The report not only helped to make weed control work by the various groups more efficient and effective but was also crucial in enabling COVID recovery funding to be utilised in the project via WDC. This meant that WDC contractor time could be put into the project and considerable progress made.

CASE STUDY *cont.*

WDC contractors clearing wattle from the control area

Contractors and volunteers planted natives provided by NRC into areas cleared of weeds.

Area of dune at Ruakākā formerly overtaken by coastal wattle.

6 Te Mata o Te Whenua Terrestial

Lisa and Sara Brill (Biosecurity) in Tāika Forest in front of an old pūriri.

Terrestrial Environment Fund

The Terrestrial Environment Fund to exclude stock supports landowners 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 2021-2022 delivered:

- 7 projects
- $47,548 in grants
- 8.2 km fencing

The Terrestrial Environment Fund will be distributed by the Land Management team in 2022-2023 as it aligns more closely with their work with landowners and funding of fencing for freshwater outcomes.

Tāika Biodiversity Values Assessment

A comprehensive biodiversity assessment of the NRC-owned Tāika Forest (Mount Tiger Forest) was undertaken to provide an inventory of biodiversity, an assessment of biodiversity values and recommendations to guide biodiversity management.

Biodiversity assessments included:

- Native vegetation
- Pest plants
- Wetland Condition Index
- Birds
- Bats
- Īnanga spawning habitat assessment
- Pest animals
- Herpetofauna (lizards and skinks)
- Freshwater fish and macroinvertebrates
- Fish passage
- eDNA for fish, macroinvertebrates, and other organisms

Biodiversity values were high in both terrestrial and aquatic ecosystems, and many rare, Regionally Significant, At Risk or Threatened flora and fauna were found. Pest plants, animals, and other risks were also identified, and an initial set of recommendations were made to support biodiversity maintenance and enhancement.

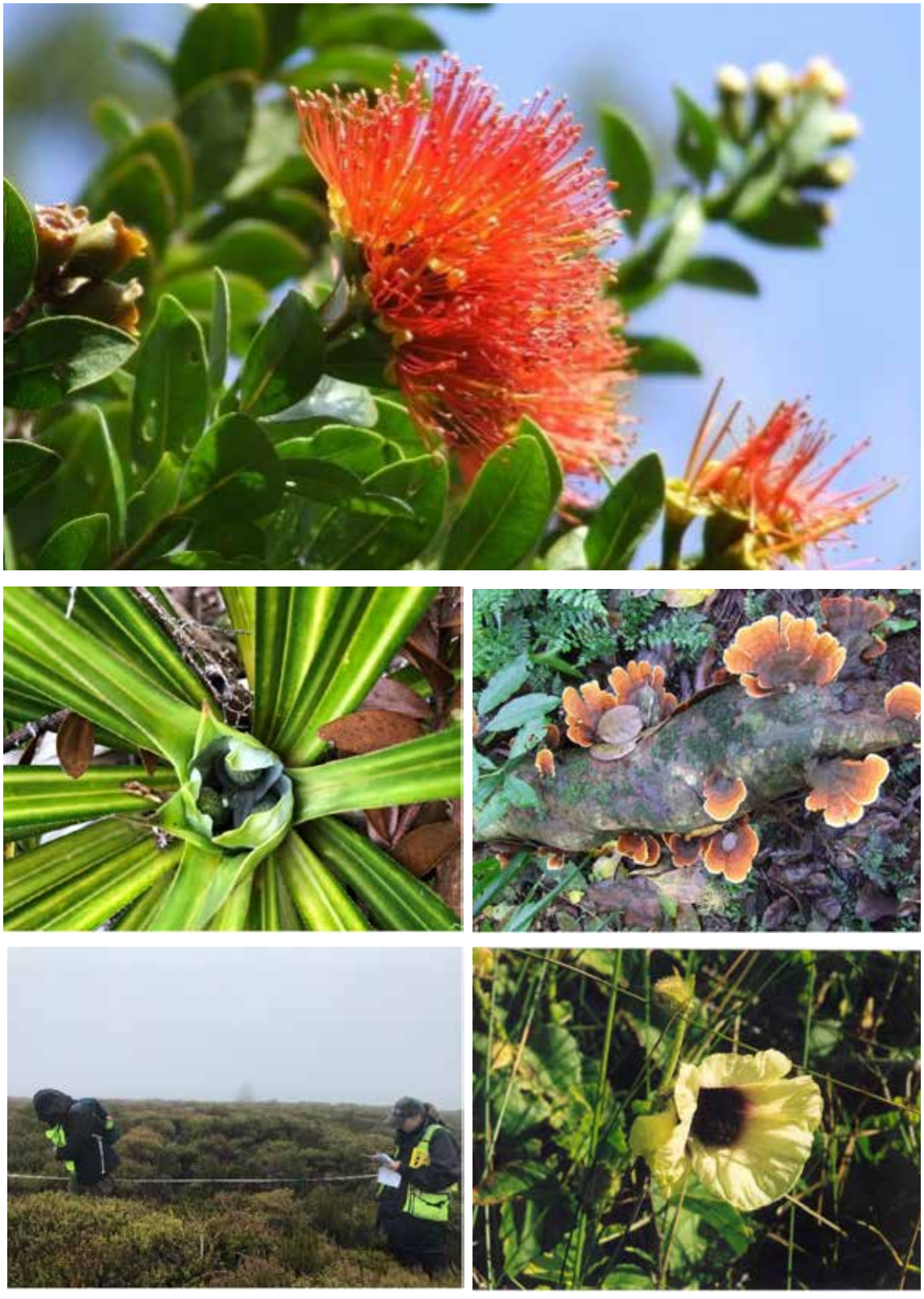
Botanical Rambles

This year marked the beginning of weekend social Botanical Rambles organised by the Biodiversity team – an afterhours opportunity for keen NRC staff and others, to explore the diversity of plants in Te Tai Tokerau 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. More rambles are planned for 2022/23.

During the 2021-2022 year (and despite COVID!) two events were held:

- Maungatāpere (focus on filmy ferns)
- William Upton Hewett Reserve (focus on orchids)

NRC crew on a botanical ramble in William Upton Hewitt Reserve



Clockwise from top: Orange rātā (Metrosideros fulgens). Bracket fungi from Jacks Bush, Pakaraka. *Hibiscus diversifolius* near Te Paki. NRC staff undertake a vegetation survey at Whakakoro. Kiekie *(Freycinetia banksii)* flower (tāwhara) and fruit (ureure/tēure).

CASE STUDY

Tāika Forest Biodiversity Assessment

In early 2022, NRC led a species inventory and biodiversity values assessment of Tāika Forest and found that biodiversity values were very high especially for aquatic and terrestrial ecosystems.

Tāika Forest is home to many lifeforms, from unique and rare invertebrates such as the velvet worm or peripatus (*Peripatoides sympatrica*), to multiple gecko species, a new recorded location for Nationally Critical long-tailed bat (pekapeka-tau-roa; *Chalinolobus tuberculatus*), the Regionally Significant kūkupa *(Hemiphaga novaeseelandiae)* and the iconic North Island brown kiwi *(Apteryx mantelli)*.

With a flora of 363 plant species recorded by the team, the vegetation of Tāika is diverse and contains the same breadth of rarity, conservation value and regional significance as the fauna. In addition, the overall landscape provides significant habitat (and habitat connectivity) for many species in the area.

While biodiversity values were found to be high within Tāika Forest, many species will require active management interventions to safeguard them.

These can be achieved through implementing the recommendations in the Tāika Forest Biodiversity Assessment Report, such as pest plant and pest animal control and the development of appropriate best management practices for forestry. Outcome monitoring is recommended to track management effectiveness.

To support outstanding biodiversity outcomes, long-term investment and community help is needed. The size, location and current values of the forest, make this a future possibility.

As the current landowner, NRC is uniquely placed to implement effective measures for biodiversity enhancement, with access to a remarkable array of skills and expertise in-house. Ngāti Kahu o Torongare and associated hapū have valuable skills, long-term knowledge and an ongoing, intergenerational interest in seeing the biodiversity of Tāika Forest thrive. Actively managing biodiversity values in Tāika Forest presents an excellent opportunity to both demonstrate excellence in land stewardship as well as treaty partnership.

Recommendation summary:

- Establish a partnership approach with hapū to biodiversity management and monitoring in Tāika Forest.
- Develop a Biodiversity Management and Monitoring Plan for Tāika Forest.
- Make corrections to culvert system to meet fish passage requirements.
- Write and implement a Pest Animal Management Plan.
- Review current forestry practices and implement best practice where it is not already applied, and ensure it reflects latest relevant Government regulations such as NPS-FM.
- Ensure gaps in information of bat and lizard habitat are obtained prior to the next harvest of *Pinus radiata*, and appropriate management actions are taken to ensure their protection.
- Ensure internal and external parties work collaboratively to deliver the highest possible biodiversity outcomes for Tāika Forest.

433
species identified

23
At Risk or Threatened species

38
pest plants

1
raupō swamp

2
threatened birds

2
gecko species

1
new location of pekapeka-tou-roa (long-tailed bat)!

6
barriers to fish passge

1
Nationally threatened Mayfly

Top: Biodiversity team . Middle: Well disguised stick insect, Wairua Oxbow. Bottom left: Mairehau (Leionema nudum) in flower, Maunga Tāika, Whangārei. Right: Velvet worm or Peripatus in Tāika Forest.

Northland
REGIONAL COUNCIL
Te Kaunihera ā rohe o Te Taitokerau