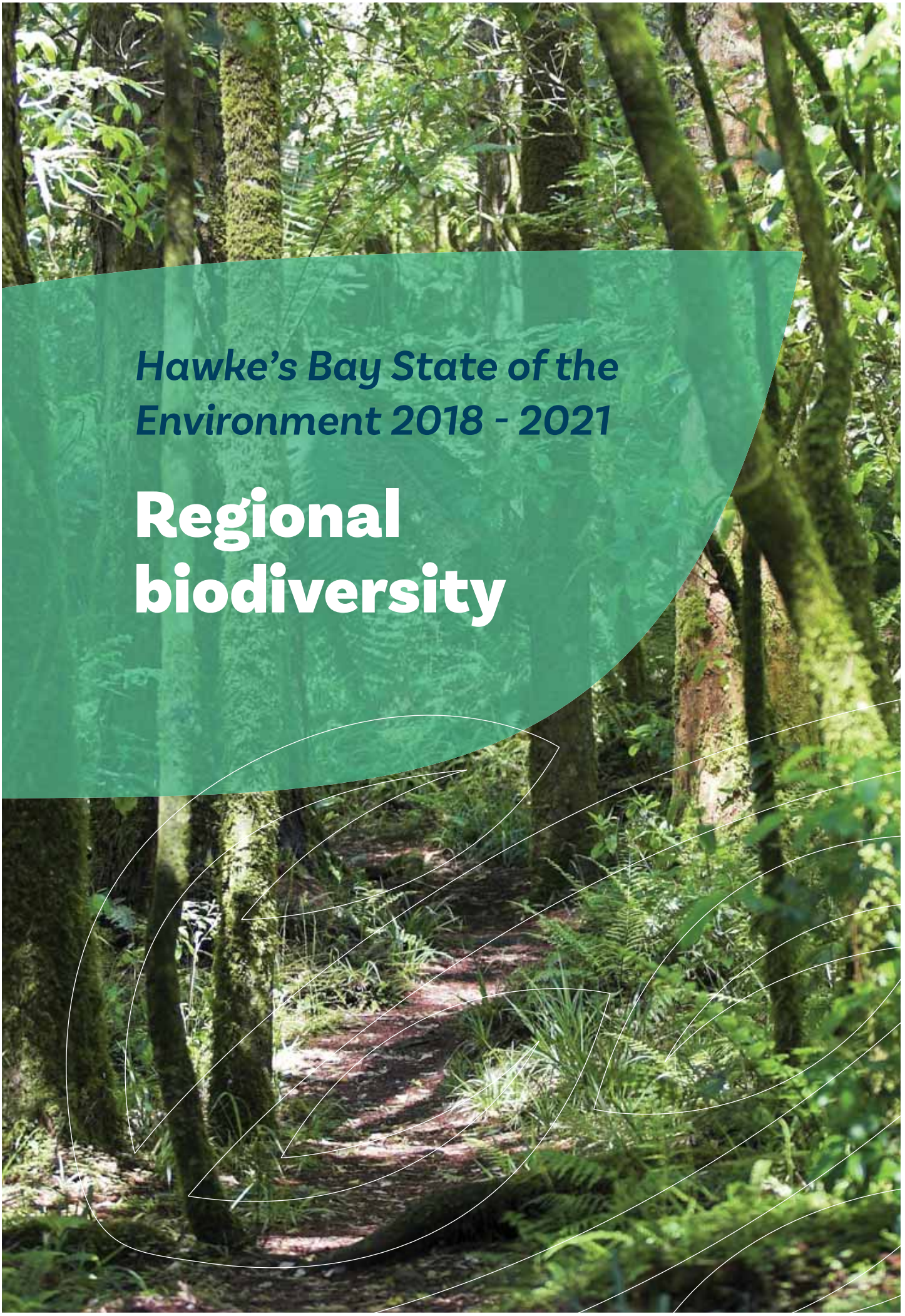


Hawke's Bay State of the Environment 2018 - 2021

Regional biodiversity

2. Biodiversity in Hawke's Bay

Indigenous biodiversity in New Zealand is in crisis, with around 4000 species currently threatened or at risk of extinction. In Hawke's Bay, only 34% of the indigenous ecosystems covering the region before human occupation remain (Figure 2-1).

Half our remaining forest types are categorised as threatened, with the greatest losses to lowland forest types. For example, tōtara/titoki forest would historically have dominated flatter areas throughout the region, covering around 313,500 ha. Only 5.5% (17,260ha) remains today.

Much of our remaining forest cover is secondary forest. This means it is regenerating after disturbance, and the species present now are different to what was originally there.

Many of our remaining ecosystems are subject to a range of further pressures, particularly browsers and pest plants. Without management, the original ecosystems in many areas are no longer self-sustaining and are at risk of collapse.

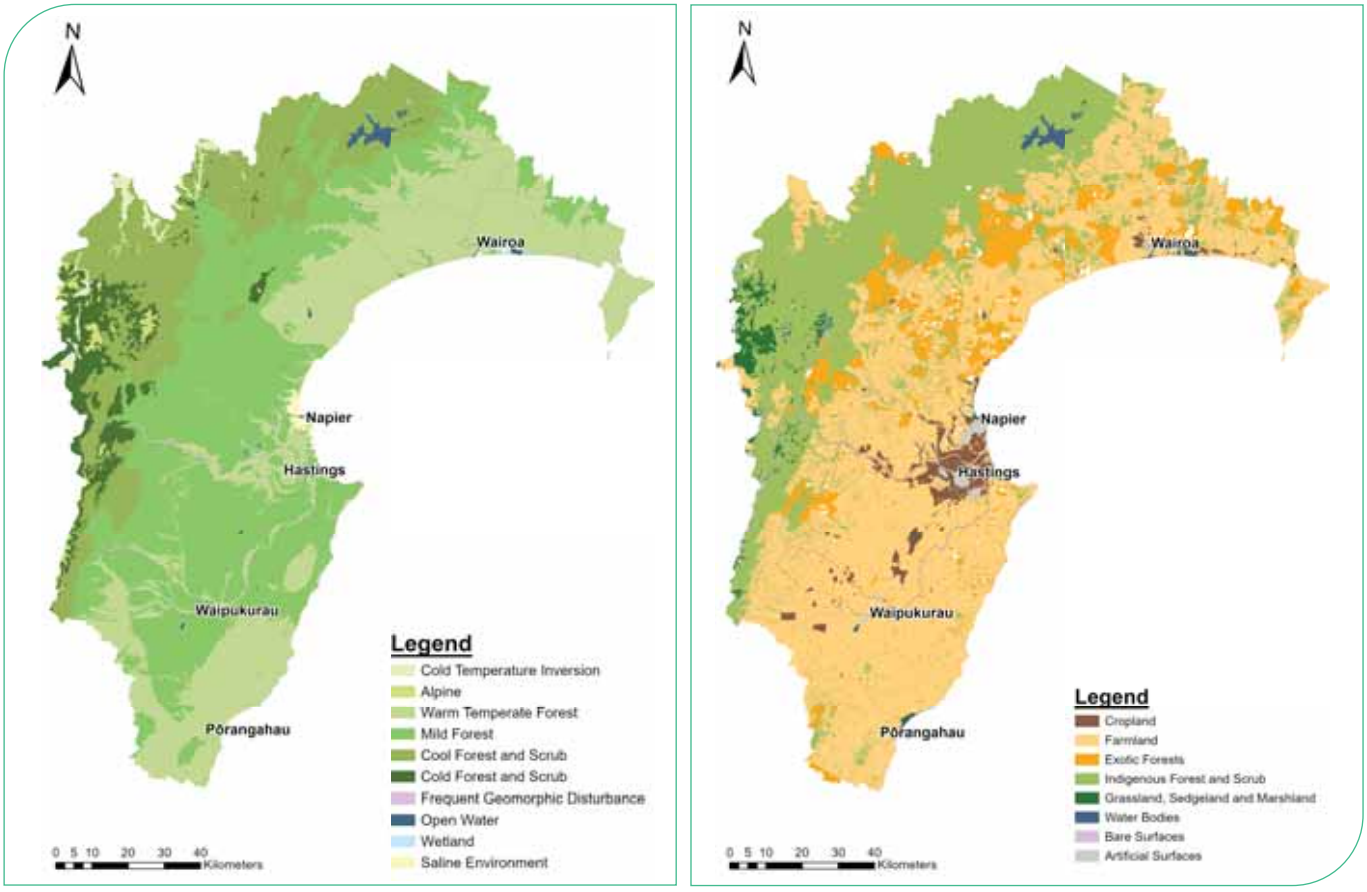


Figure 2-1. Estimated extent of native vegetation prior to human settlement (left) and extent of native vegetation remaining today (right).

Current state of terrestrial biodiversity in Hawke's Bay

Consistent information about the state of terrestrial biodiversity across Hawke's Bay is currently not available however we are working in partnership with other regional councils to implement new protocols to generate this information across New Zealand. This will allow us to better assess the impact our conservation programmes are having, and whether we are effective at halting biodiversity decline.

Wetland monitoring

Only 4% of original wetland extent remains in Hawke's Bay, largely driven by drainage and modification of these habitats. Wetlands are one of the rarest and most threatened ecosystem types in the region.

We have surveyed 36 wetlands across the region as part of our wetland monitoring, and the wetland programme has just been extended to the Pōrangahau and Southern Coast catchments.

The surveys look at vegetation, soil, birds, and water levels in each wetland, which gives us an indication of the health of the system using the Wetland Condition Index. A quarter of the wetlands have been scored as excellent (Table 2-1), while the remainder scored between good and poor due to browsers damaging the vegetation, and the dominance of exotic plant species (Figure 2-2). Even sites with native-dominated canopies often had herbaceous exotic plants in the understorey.

Table 2-1. Wetland Condition Index scores for monitored wetlands.

Wetland Condition Index	Interpretation	Number of wetlands
≥ 20 - 25	Excellent	9
≥ 15 - 20	Good	17
≥ 10 - 15	Moderate	9
< 10	Poor, degraded	1

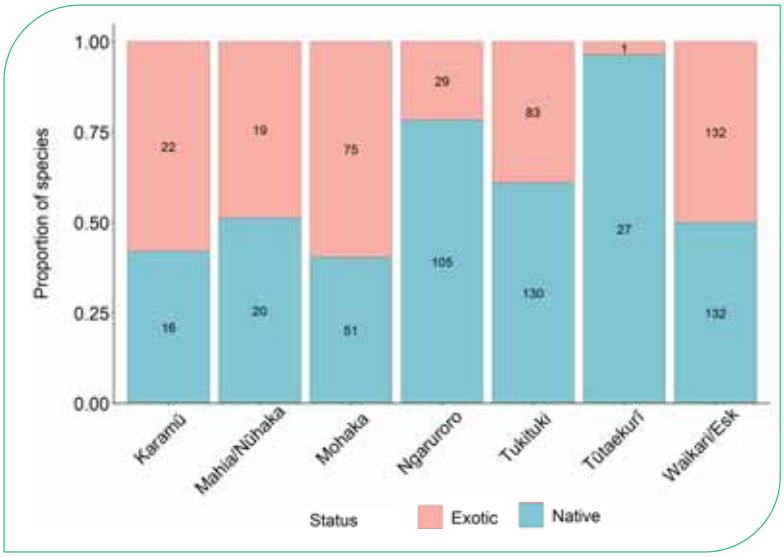


Figure 2-2. Proportion of native and exotic species at wetlands in each catchment.

Figure 2-3. Wetland vegetation near Kaweka Lakes.

Bird surveys

The Hawke's Bay coastline and braided rivers provide breeding habitat for internationally, nationally, and regionally significant populations of indigenous birds.

Our braided rivers were surveyed in 2019, 2020, and 2021, and 321km of coastline in 2021 (Figure 2-4), to improve our understanding of the abundance and distribution of local birds. The bird surveys resulted in the following important findings.

- Indigenous shorebird species diversity was highest at estuaries, river mouths, and coastal lagoons; on inshore islands; and along sections of coastline with mixed rocky shore and sandy beach habitats.
- Tūturiwhatu/New Zealand dotterels (Figure 2-5), which were locally extinct, have experienced a substantial increase in population size and breeding range along the coastline since 2011.
- 2436 adult banded dotterels on average were counted during the 2019 and 2020 surveys, representing about 13% of the global population of this species. The Tukituki River and its tributaries now support the second largest single-river breeding population of banded dotterels in New Zealand.
- An average of 44 adult South Island pied oystercatchers were counted during the 2019 and 2020 surveys. Hawke's Bay has the only breeding population of this species in the North Island.
- Hākoakoa/sooty shearwaters were found breeding on Te Motu-o-Kura Island.

Figure 2-5. Tūturiwhatu/New Zealand dotterel.

Figure 2-4. Spatial patterns in the species richness of indigenous bird species along the Hawke's Bay coastline.

Figure 2-6. Pekapeka tou roa/long-tailed bat (photo by The Conservation Company).

Bat surveys

The critically endangered pekapeka tou roa/New Zealand long-tailed bat was surveyed in 2020 and 2021 using automatic acoustic recorders (Figure 2-6). Bats were recorded at 85% of the 36 sites surveyed (Figure 2-7) but were absent at sites close to urban areas. They were found roosting in areas of suitable habitat including large exotic trees as well as old-growth native forest remnants.

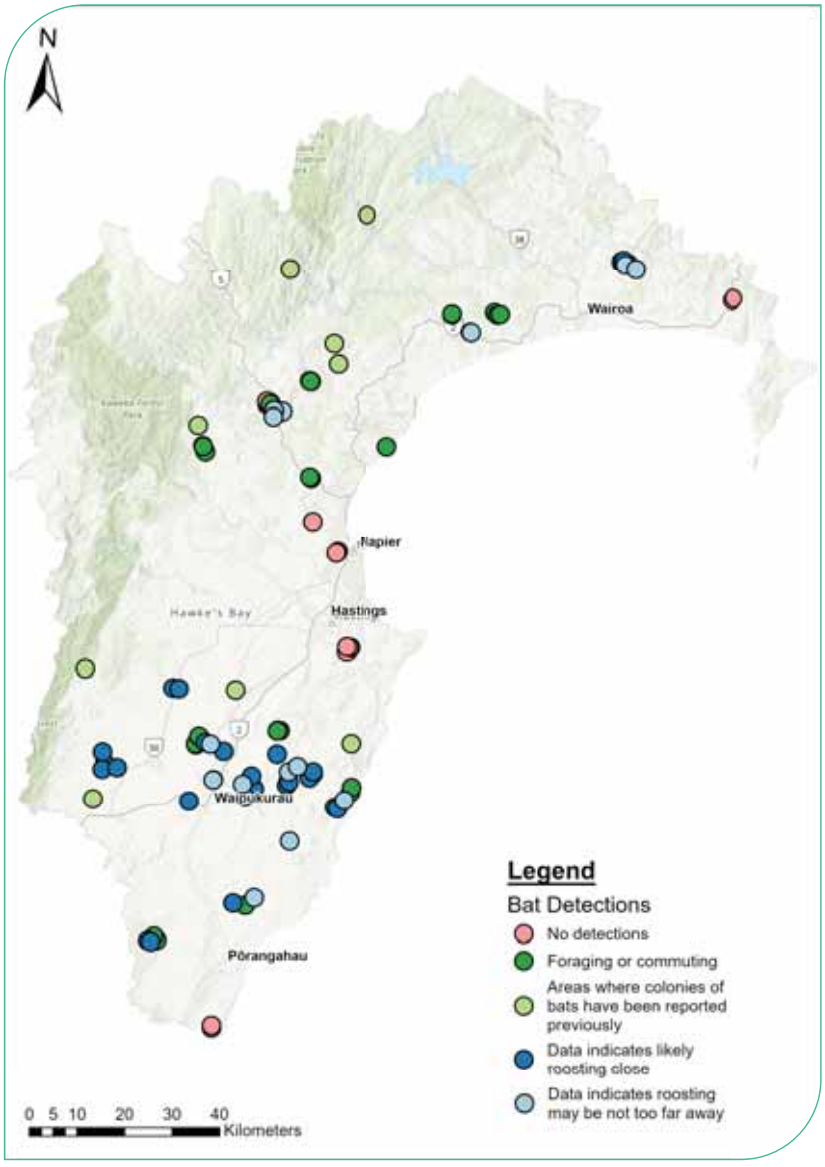


Figure 2-7. Bat survey locations and detections.

Programmes to improve biodiversity outcomes

HBRC has a range of programmes that help protect and enhance biodiversity, including the Ecosystem Prioritisation Programme and biosecurity projects including the Possum Control Area Programme, Predator Free and Pest Plant Programmes, and the Marine Biosecurity Programme.

Ecosystem Prioritisation Programme

The focus of this programme is to prevent the further loss of remaining high biodiversity ecosystem remnants in Hawke's Bay. We have prioritised 30% of terrestrial indigenous ecosystems using Zonation, a conservation planning tool. Of the 700 prioritised sites, 40% are on private land, so working with landowners to protect these remnants is critical. Two examples of where this public-private partnership is working well are Orea Swamp and Little Bush.

Orea Swamp is a 6.6ha swamp in Central Hawke's Bay (Figure 2-8). It is a remnant of what was once an extensive mosaic of swamp and alluvial kahikatea/tōtara/matai forest, which is now an acutely threatened forest type.

Kūweto/spotless crake and pekapeka tou roa/long-tailed bats, both threatened species, have been recorded at Orea Swamp, and the endangered New Zealand tadpole shrimp (Figure 2-9), which is only known from one other site in Hawke's Bay, has also recently been discovered here. HBRC, in partnership with the landowners, the Conservation Company, Omakere School, and the Department of Conservation have constructed a deer fence to protect the wetland from browsers. They have also undertaken pest plant control and revegetation.

Figure 2-9. Underside of the tadpole shrimp (photo from The Conservation Company).

Figure 2-8. Fenced alluvial forest remnant at Orea Swamp.

Little Bush is a remnant of kahikatea/rimu forest, an ecosystem type that now covers only 12.5% of its original extent. The reserve near Puketitiri is managed by Forest and Bird, who actively control weeds and predators.

The reserve was fully fenced to exclude stock. However, feral deer were still causing extensive vegetation damage and altering the composition of the forest understorey (Figure 2-10; see Ecosystem Health section). Therefore, HBRC recently partnered with landowners to construct a deer fence around the reserve (Figure 2-11).

Figure 2-10. Deer damage at Little Bush prior to the construction of the deer fence.

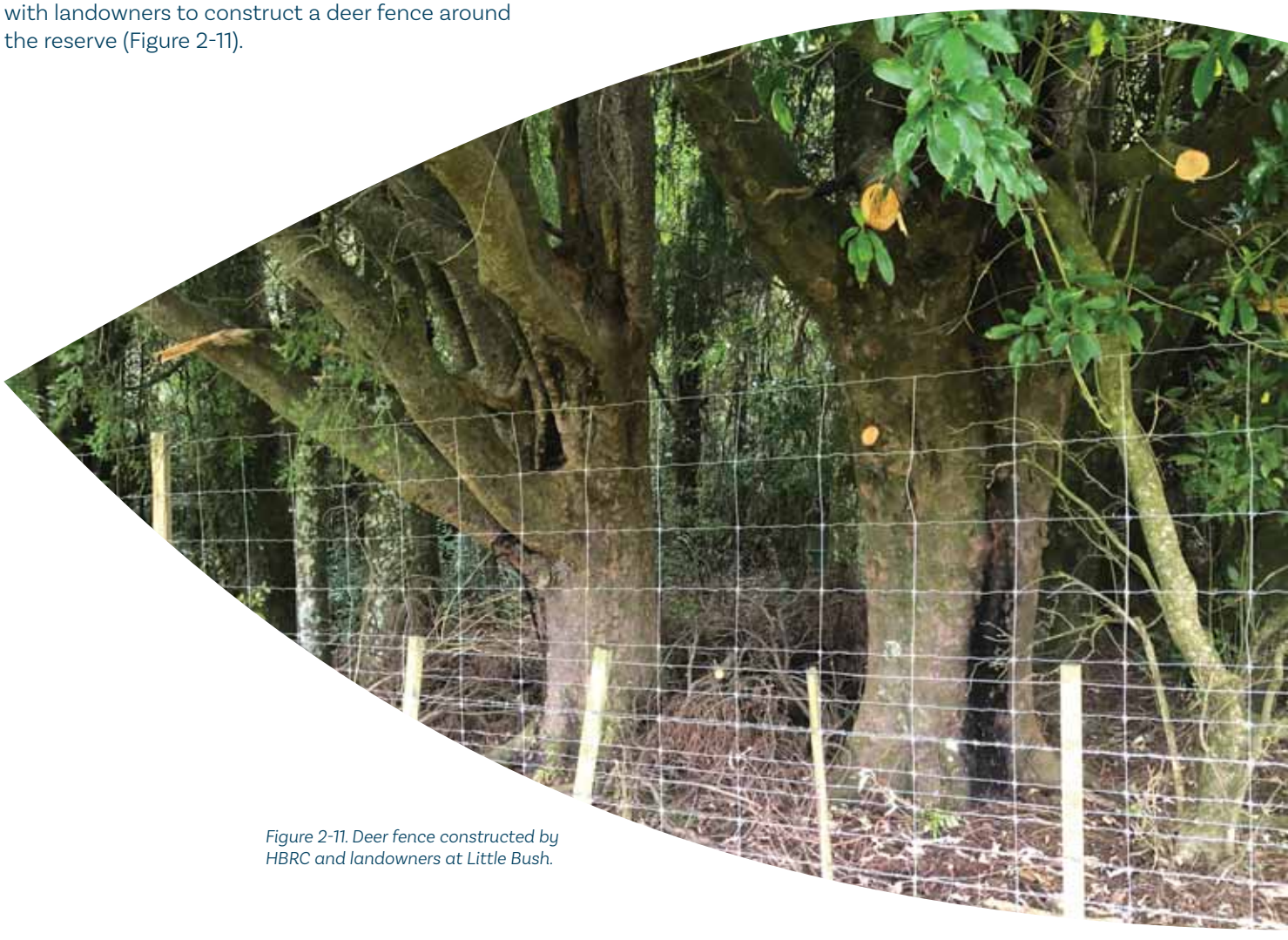


Figure 2-11. Deer fence constructed by HBRC and landowners at Little Bush.

Biosecurity programmes

Pest plants and animals impact heavily on biodiversity in Hawke's Bay and HBRC's Biosecurity Team works to minimise these impacts. More information on pest animals and weeds can be found on HBRC's online Pest Hub[1].

Possums and other predators harm biodiversity both directly, by preying on native insects and birds, and indirectly, by altering habitats important to native species. HBRC's Possum Control Programme covers 774,450ha across the region, where possums are maintained at or below 4% residual trap catch rates.

In addition, the Predator Free Hawke's Bay project is on track to eradicate possums from the 14,600ha Mahia Peninsula by the end of 2022 (Figure 2-12). Decreased browsing pressure has already led to increased growth of trees on the peninsula, and in late 2020 a pair of kākā were seen there.

The Poutiri Ao ō Tāne and Cape to City programmes have involved wide-scale predator control across 34,000ha, with council activity in these programmes significantly reducing. Bird counts have shown that toutouwai/robin, tūī, korimako/bellbird, pīwakawaka/fantail, riroriro/grey warbler, and titipounamu/rifleman have all increased in the programme area as a result.

Pest plants pose a significant threat to our native ecosystems by smothering, outcompeting and preventing regeneration of native plants. Our Pest Plants Team manages a range of pest plants to minimise their impacts on indigenous ecosystems. For example, Japanese honeysuckle (Figure 2-13) can climb over and smother plants, leading to canopy collapse.

Figure 2-12. Pouri Rakete-Stones checks a wireless leghold trap at Whakatipu Mahia (photo by Natalie de Burgh).

Figure 2-13. Japanese honeysuckle smothering vegetation.

[1] https://www.hbrc.govt.nz/environment/pest-control/pest-hub/

Figure 2-14. The invasive kelp wakame on the rocky intertidal zone at Hardinge Road in Ahuriri.

Like land-based pests, marine pest species outcompete natives and alter ecosystem processes, as well as impacting our marine industries. More than 150 exotic species are already in New Zealand coastal waters, including the invasive kelp wakame (Figure 2-14), which is already widespread in the Napier port area. Other marine pests, such as the Mediterranean fanworm and clubbed tunicate are not known to be established in Hawke's Bay but are present in other areas of New Zealand.

Marine pests are often introduced as biofouling on boat hulls or in the ballast water of marine vessels. Napier's coast is at high risk for marine biosecurity incursions because of the port, which creates exposure to large amounts of biofouling and ballast water discharges.

To keep our marine environment free of new invasive pests, HBRC has created a Marine Biosecurity Programme. This includes requirements for incoming vessels to meet the clean hull standards before entering the harbour. Divers also regularly check for pests on vessel hulls and harbour structures.

Future of biodiversity in Hawke's Bay

Although landowners, community groups and government agencies have been working hard to achieve biodiversity outcomes across Hawke's Bay, biodiversity and habitat loss continue in many areas. The land cover database shows that from 1996 to 2018, 631ha of mānuka/kānuka scrubland and 163ha of broadleaf indigenous hardwood forest were converted to low production grassland.

The remaining remnants of indigenous vegetation are under a range of pressures, and managed sites continue to need ongoing support and investment. We also need to continue to develop better monitoring programmes to inform these management actions.

Freshwater biodiversity

Fish monitoring

Hawke's Bay is home to 15 of the 54 native freshwater fish species found in New Zealand. One of these species is classified as threatened with extinction, and six species are at risk of extinction. Most of these species are migratory, meaning they swim between the sea and freshwater during different parts of their life cycle.

HBRC monitors freshwater fish populations at 20 wadeable stream and river sites every summer. Five of the sites are 'reference' sites, which are sampled each year, and the remaining 15 'rotating' sites change each year.

At some of the reference sites, we have found variation from year to year in the abundance of species like redfin bullies, as well as variation in species richness, or the number of different species we catch (Figure 2-15). This variability could be caused by disturbance (eg, floods wiping out populations or changing the streambed environment); by changes in recruitment success (eg, juvenile fish returning from the sea); or by sampling errors that mean species with small numbers are caught in some years but not in other years. This variability highlights the importance of long-term monitoring.

At the rotating sites, we have found fish species, such as the regionally rare banded kokopu and koaro, in places we didn't know they existed (Figure 2-16).

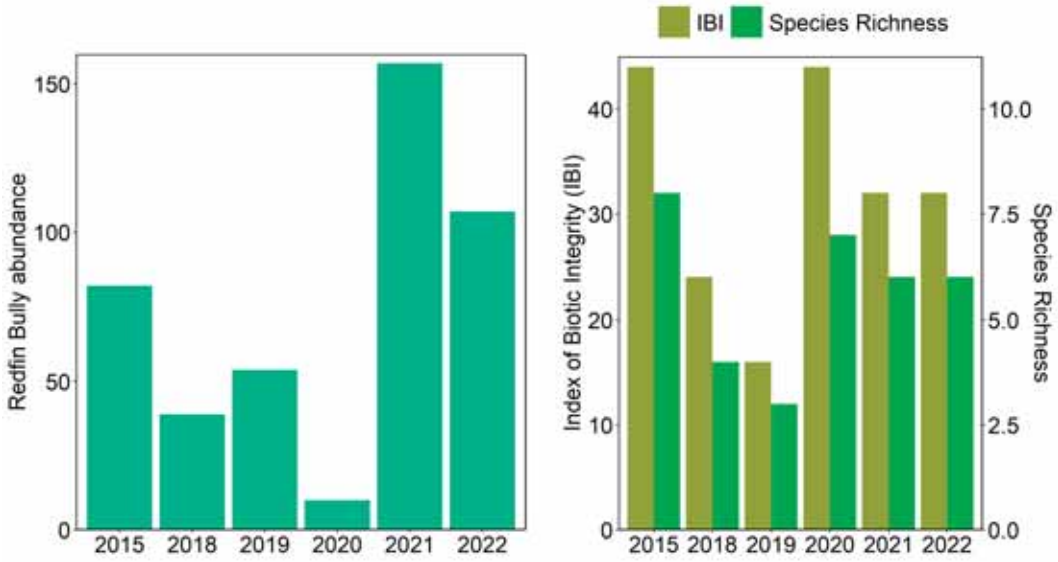


Figure 2-15. Redfin bully abundance (left) and fish species richness (right) in the Maraetotara River at Te Awanga survey site.

Figure 2-16. A koaro and redfin bully (circled) in a tributary of the Waipatiki Stream, where they had previously not been observed.

Figure 2-17. Coloburiscus or stony gilled mayfly.

Macroinvertebrate monitoring

If you pick up a rock in a stream and turn it over, tiny bugs will often be seen crawling around on its surface. These freshwater bugs are called macroinvertebrates – 'macro' because you can see them without the use of a microscope, and 'invertebrates' because they don't have backbones. New Zealand has over 200 freshwater macroinvertebrate species living in rivers, streams, lakes, and wetlands.

In rivers and streams, councils use macroinvertebrates as way of measuring ecosystem health. Each macroinvertebrate species has a varying tolerance to temperature, sediment, organic pollution, and other stressors. Depending on these tolerances, each species can be given a macroinvertebrate index (MCI).

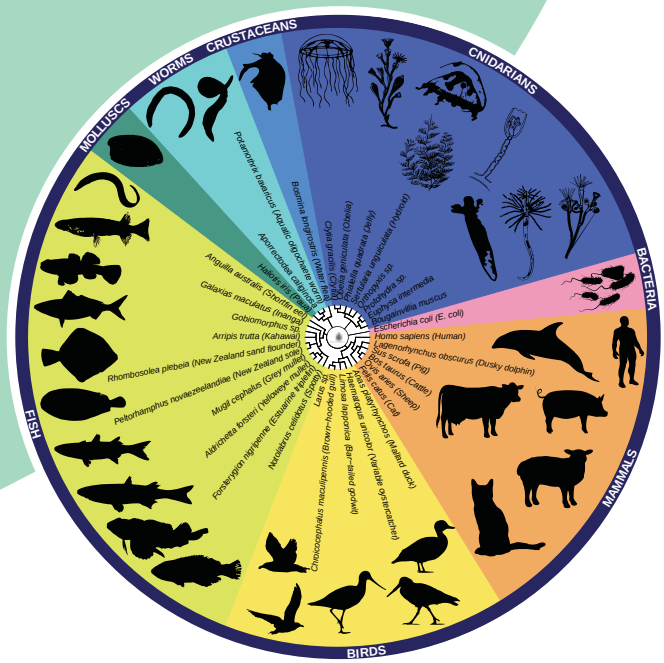
For example, a mayfly (Figure 2-17) is sensitive to pollution and so has a high MCI score, whereas a worm is not sensitive and has a low MCI score.

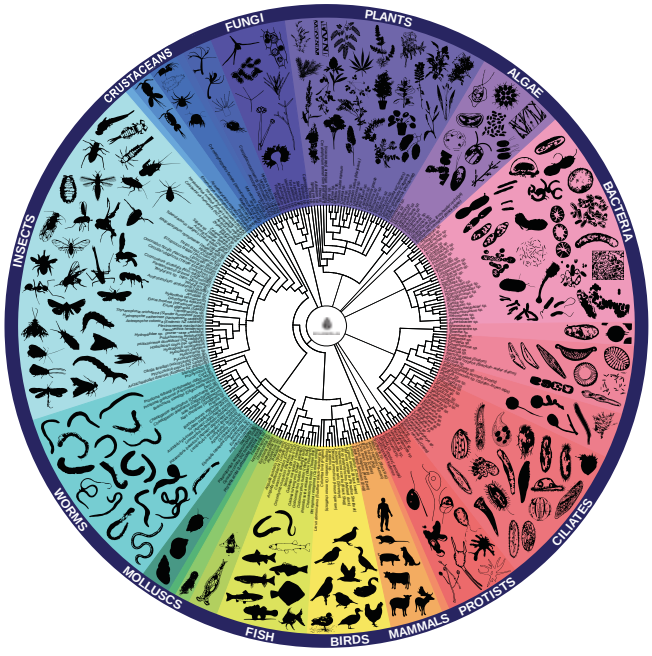
In a river, the macroinvertebrate community as a whole has a high score at sites where many sensitive species are present. At a disturbed or polluted site, sensitive species are lost, and mainly tolerant species with low MCI scores are left, leading to a low overall MCI score for these sites.

When HBRC conducts river monitoring, macroinvertebrates are sampled and each site is given an MCI score. Scores over 130 indicate pristine ecosystem health, whereas scores less than 90 indicate severe organic pollution or nutrient enrichment. The monitoring and reporting of MCI is mandated under the National Policy Statement for Freshwater Management (NPS-FM 2020).

eDNA

In 2019, we were one of the first councils in New Zealand to trial eDNA, a new bio-monitoring tool for investigating what is living in, on, or near our waterways. Short for environmental DNA, eDNA detects fragments of living things in the water column. This could be mucus or scales from a fish, faeces from birds or mammals, or minute traces of plants, bacteria, or fungi. The DNA signature in these fragments is matched against a reference database of DNA 'barcodes' for different species.





Using eDNA has many benefits. It is able to test for the presence of rare, threatened, or pest fish, birds, plants, insects, or mammals, all from one set of filtered water samples. It can also detect organisms further away from the point of survey, and it allows us to sample large rivers that are too deep to wade.

HBRC is planning to roll out eDNA monitoring at all 96 river survey sites, which will help us understand in much more detail the locations of species in and around our waterways. It will also help us fulfil NPS-FM requirements around ecosystem health and threatened species monitoring at the scale of Freshwater Management Units (FMUs), something that would have been difficult to achieve using traditional monitoring techniques.

HBRC has also used eDNA in regional estuaries. The results showed the presence of some expected land-based species and coastal species that visited river mouths and estuaries. They also revealed the presence of some oceanic species that passed by on the coast. We are planning to include eDNA as a monitoring tool for biodiversity across all estuary and nearshore coastal monitoring sites in the future.

We will also be exploring how we can use eDNA to inform the Index of Biological Integrity (IBI) for fish, which is a compulsory attribute in the NPS-FM. This method uses six metrics based on the types and sensitivities of fish species present, as well as the relationships of these metrics to the site's distance inland and elevation.

Because of the way the IBI is calculated, high year-to-year variations in fish species richness significantly affects the IBI scores. For example, based on the variation in Figure 2-15, the IBI scores for each year would vary from 'excellent' to 'poor'. Because eDNA can detect species further away, this method should reduce variability in IBI scores and provide more robust assessments of ecosystem health.

Figure 2-18 shows the diversity of life forms detected using eDNA at two monitoring sites. You can see that different eDNA assays target different areas of the genome depending on the type of organism. At Ngaruroro, 12 assays were used, which captured a huge variety of different lifeforms. In contrast, at Pōrangahau we only used four assays to target fish and other vertebrate groups.

Figure 2-18. eDNA 'wheel of life' from the Ngaruroro River at Fernhill (bottom) and the lower Pōrangahau Estuary (top). The presence of each species is indicated with a representative icon.

Coastal biodiversity

Many different species find a home along the Hawke's Bay coastline – from microscopic animals living in the sand and mud of our estuaries and beaches, through to the huge tohorā/southern right whales that use the Hawke's Bay coastal waters as a nursery for their young.

Our coastal biodiversity monitoring programmes cover intertidal rocky reefs, subtidal habitats, sandy beach dunes, and estuaries.

Rocky reefs

Rocky intertidal platforms are the second most common intertidal habitat in Hawke's Bay, constituting 42% of the coastline. Figure 2-19 shows an example of a rocky reef located in Te Mahia. Organisms on rocky reefs are subjected to pressures from both land and sea (eg, warmth from sunlight during low tide and wave action during high tide). Despite this harsh and dynamic environment, rocky reefs are some of the most biologically diverse habitats in Hawke's Bay.

Rocky reefs provide many ecosystem services, including shelter, nursery grounds, and feeding areas. They stabilise shorelines, protect the coast from waves, and provide homes for kai moana.

We have recorded algae, sessile (immobile) species, and mobile species at three rocky reef sites since 2011. To date, communities have maintained their diversity and have remained relatively stable. Heat stress from recent intense marine waves had an impact, but the resident species have since recovered (for more detail on marine heat waves see Marine and Coast section).

The functional resilience of rocky reefs is high, meaning multiple species perform the same ecosystem function. This means that if one species is affected by environmental change, another may take on its role in the ecosystem, preserving overall community health (see Ecosystem Health section).

Figure 2-19. A rocky reef in Te Mahia.

Beaches

Sandy beaches are highly valued ecosystems, not only for recreation and scenic views, but for their cultural significance. Hawke's Bay is home to some of the most significant dune systems on the east coast of the North Island.

Like rocky reefs, sandy beaches buffer the land from waves. They also store sediment, nourishing the beaches and supplying sediment between the coast and the ocean floor. Beaches provide nesting, foraging, and nursery habitat for a variety of birds, reptiles, and invertebrates.

Native dune vegetation has been impacted by exotic weeds and competitors, browsing predators (especially rabbits), trampling and grazing stock, and vehicles (Figure 2-20). One way to assess dune health is called a dune condition index, which is a rapid method that measures the state of the dune and the pressures on it.

Waimarama Beach was recently assessed and found to have the poorest condition of sites surveyed to-date. The main pressures at this site were predators, vehicles, and loss of indigenous land cover (for details see Marine and Coast section).

Figure 2-20. Left: Often the only evidence of dune pressures such as vehicles and predators are tracks in the sand. Right: Pīngao, the golden sand sedge, was once common around New Zealand, but has suffered a dramatic decline.

Figure 2-21. Aerial view of the Tukituki Estuary (photo by Peter Scott, www.abovehawkesbay.co.nz).

Estuaries

Estuaries are the downstream environment that receives freshwater from the drainage network before it enters coastal waters (Figure 2-21). They are the most at-risk coastal environment in New Zealand because they are where many contaminants from the surrounding catchment are deposited.

Estuaries have many important ecosystem functions. They help regulate our atmosphere and cycle nutrients through microbes living on and in the sediment. Smaller organisms produce the basis of the food chain upon which larger organisms thrive, providing a source of food for fish and birds. Estuary species like cockles filter large volumes of seawater, while small worms and crabs keep the sediment full of oxygen.

The input of fine sediments is a key stressor for estuary organisms in Hawke's Bay. Sediments can limit species abundance which in turn lowers the functional resilience of estuaries. When this happens, a change to the environment that affects one species may cause the whole community to collapse (for details see Marine and Coast section).

Our biodiversity is the key to our environmental health. Our many programmes aim to highlight the gaps in our understanding and measure the success or failure of our restoration efforts.